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July 12, 1999

Lisa L. Diekmann
Executive Director
Yellowstone Park Foundation,
37 East Main Street, Suite 4
Bozeman, MT 59715

Dear Lisa,

It is with great pleasure that we include a copy of our final report on winter visitors to Yellowstone National Park. This report is a result of the funding generously provided by the Yellowstone Park Foundation and the National Park Service. It represents the collaborative effort of researchers from the University of Montana, the University of Vermont, and the staff of the Yellowstone National Park. In addition, a financial report is included using the format provided by the Pew Charitable Trusts.

In reviewing the objectives of this research project :

> Researchers from the Universities of Vermont and Montana will collaborate on a detailed survey of park visitors to determine the degree to which snowmobile use, including air pollution, is impacting the public's use and enjoyment of Yellowstone. Data will be produced that indicate how park users feel about noise, crowding, and the aesthetic impacts associated with high levels of snowmobile use, as well as measuring public opinion about potential management changes to control pollution.

we feel confident that the research presented in the report well documents the characteristics, use patterns, and perceptions of winter visitors to Yellowstone National Park (YNP) in 1998. We believe the results will be of great assistance to park planners, managers and others. A better understanding of the winter visitor, their visit to YNP, the motivations for their visit, and their preferences will help protect and maintain the park resources and the quality of the visitor experience. Without information of this nature an understanding of who the winter visitors are, what they are seeking, and their impressions of the park and its management would instead be based largely on intuition and guesswork. We hope these results help demonstrate the usefulness of such visitor data and can serve as a baseline for future study and monitoring of visitation and social conditions in YNP.

In particular, we have found a great diversity among the winter visitors to Yellowstone and it may not be particularly appropriate to segment those visitors based on whether or not they snowmobile during their visit to the park. Secondly, the winter visitors to Yellowstone generally perceive the current conditions and management strategies to be fair and appropriate. There is not necessarily perceived to be a problem with current levels, patterns and impact of use that requires or justifies drastic action. In the absence of another surge in demand or a dramatic alteration of the visitor experience by park management action, it is likely that satisfaction levels

will remain high. These data suggest that park managers, planners and others have a good window of opportunity in which to conduct thorough and extensive planning efforts and to gradually see the implementation of such plans. We anticipate the results of this study to be of great value in such planning efforts and look forward to assisting in their interpretation and application.

We are especially grateful for the support of the staff of the Yellowstone National Park and of the Yellowstone Park Foundation in the conduct of this research. It has been a pleasant and productive collaboration, and one which should be of lasting benefit to Yellowstone and its visitors.

Sincerely,

Bill Borrie

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Winter Visit and Visitor Characteristics of Yellowstone National Park

Final Report 1999

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Executive Summary

This research was designed to assist the managers of Yellowstone National Park (YNP) in their decision making about winter visitation. The focus of this report is on winter use patterns and winter visitor preferences. It is the author's hope that this information will benefit both the quality of winter experiences and the stewardship of the park resources. This report addresses three fundamental questions: 1) Who are the visitors to YNP and why did they visit? 2) What are the characteristics of the winter visit and how do visitors travel within the park 3) What are the visitor evaluations of current social conditions? 4) Are potential management actions consistent with desired experiences?

The study gathered data from visitors in three ways. A mail back questionnaire was distributed to 1505 winter visitors, proportionately distributed across the four entrance stations on thirteen random days during January, February and March of 1998. This survey resulted in a 71 percent response rate of 1064 questionnaires. An onsite survey was administered to 208 visitors on nine random days within the same time period. Finally, onsite hourly traffic counts were collected at two interior sites on groomed roadways. This data is used to validate previously developed traffic models.

Who are the winter visitors to Yellowstone National Park?

- The respondents were 60 percent male, ranged from 18-70 years in age, and were highly educated. Over fifty percent of the visitors were college graduates.
- Most of the respondents (50%) grew up in a community of 5,000 of larger and over. Thirty percent of the respondents currently live on a farm or ranch or in a rural or small town.
- The average household income of respondents fell between $60,000 and 79,999. Nearly a third of the respondents have a household income of over $100,000.
- Over eighty percent of the visitors explored the park with family, friends or both. Only 8 percent were on a guided trip.
- The responses of this survey compare closely with previous studies of winter visitors to YNP.

How do winter visitors access and travel within the park?

- Over sixty percent of the visitors through West Yellowstone. The popularity of the west entrance is followed by the South (19%), North (16%) and the East entrance with 5 percent of the use.
- Over 70% of the visitors used only a snowmobile while in the park. Approximately six percent use only a car, seven percent only a snowcoach and three percent only ski. The remaining fourteen percent use some combination of skiing, snowmobiling, snowcoach or automobile travel.
- Over seventy percent of the snowmobilers at the west, north and south entrances rented their snowmobiles. Only forty-four percent rented snowmobiles at the east entrance.
- Eighty-four percent of the visitors stayed in the vicinity of YNP. Forty-four percent spent a night in West Yellowstone.
- Fifty-five percent of the visitors spent more than one day in the park. Seven percent spent over five days within the park.
- Fifty-two percent of the visitors snowmobiled or skied in areas other than YNP during their trip.
- For those who recreated outside of the park, over forty percent did so for more than two days.

Why did respondents visit Yellowstone National Park?

- Respondents highly value YNP as a place for scenic beauty, a wildlife sanctuary, and protection for fish and wildlife habitat.
- There is not a "general" audience in Yellowstone's winter visitors. Respondents were varyingly interested in personal benefit and reflection, learning about nature, solitude peace and quiet, thrills, skill and fitness building, and to spend time with family and friends. Based on their interest in these outcomes, they can be reduced to clusters (or audiences) seeking four categories of experience: personal growth, nature study, quiet activity or no highly defined outcome. The later will be referred to as "Accidental" tourists.
- Most demographic variables are similar for each of the four clusters.

- There are differences in cluster membership when viewed across entrances and activities. The quiet activity cluster represents over fifty percent of the visitors using the north entrance and the skiers were dominantly within the Quiet/fitness cluster.
- Winter visitors are generally very satisfied with their visit.

What are the visitors travel patterns and perceived social conditions?

- Travel pattern modeling can be an effective and valid tool to assist in understanding travel patterns within the park. The travel pattern model of winter use in YNP developed in 1998 has been validated by this data.
- Visitors currently perceive the traffic conditions to be acceptable. Based on their assessments of crowding and congestion, use levels would need to triple before conditions became unacceptable.
- Expectations play a large role in a visitor's acceptability of encountering other visitors. Those who saw more than they expected to see were less tolerant of encounters and those who saw less than they anticipated were more tolerant of encounters.
- Acceptability ranges by cluster. The Accidental Tourists were the most tolerant of encountering other visitors while the Quiet Fitness cluster was the least tolerant.
- If the Hayden Valley were closed for wildlife protection, nearly half of the respondents that traveled that valley would still attempt to reach the same destinations via another route. Eleven percent of those who traveled the Hayden Valley would not chose to visit the park if it were closed to snowmobile use.

What type of management to the winter visitors support?

- The most supported management activity is to require all snowmachines to meet strict, but reasonable emissions and noise standards.
- Respondents supported management actions that are relatively unobtrusive. For example, there is strong support for the provision of more information on appropriate and expected behaviors, snow conditions and points of interest. Respondents were also very supportive of more information on things to do outside of the park.

- Respondents were supportive of more aggressive enforcement of speeding and safety violations indicating that they are generally willing so see sanctions placed on violators of the park rules and values.
- Respondents are generally neither supportive or unsupportive of increasing the facilities available within the park. They are supportive, however, of increased grooming.
- Respondents are opposed to management actions that would reduce access by closing roads, restricting groomed roads to snowcoaches or plowing the road from West Yellowstone to Old Faithful.
- To improve conditions for bison, respondents generally did not agree that the National Park Service should require visitors to watch a 30 minute video, wait up to an hour before traveling, travel at particular times of days or days of the week, travel in a shortened season or obtain a permit. Respondents were, on average, neutral on limiting group sizes or traveling only in specific areas.

Study results have several implications relevant to the management of the park. First, there is a wide diversity of visitors within the winter season. This would be easy to miss in that the winter visitors look largely homogenous. However, not only do visitors have different motivations for visiting the park, those motivations seem to be associated with the parts of the park they visit, and the subsequent evaluations they have of social conditions. Varying expectations can often lead to conflict among visitors and it is important to note that there is considerable variety even within snowmobilers or skiers. Indeed, when comparing snowmobilers and other forms of transportation, we found more similarities than differences. Many visitors use more than one mode of transportation while in the park and it is not straight forward or self evident to typify them by activity type. Together, these conditions may make the winter visitation somewhat difficult to understand. However, the winter experience is currently perceived by visitors to be quite satisfactory. Most people are enjoying their visit and perceive current management strategies as fair and appropriate. Visitors tend to be unsupportive of management actions that would substantially alter their current way of experiencing the park. While the current visitor population is able to identify and articulate social or managerial conditions that are unacceptable, they are pleased with current conditions and highly value the resources of the park. Given this situation, managers are provided

ample opportunity to plan for the protection of the park and its resources without the environment of a social crisis within the perceptions of current winter visitors.

Acknowledgements

This study was made possible by the support and effort of numerous people. The planning staff of Yellowstone National Park have been a source of steady support. Under the guidance of John Sacklin the planners have been very responsive in providing feedback on the issues and questions that this study has addressed. Special thanks to Kristin Legg for her assistance in all aspects of this study. We are also in great debt to the staff of Yellowstone at the entrance points who provided critical assistance during data collection.

Appreciation is extended to the Yellowstone Park Foundation, The Pew Charitable Trusts and Yellowstone National Park for their support in funding for this study. We are also grateful to the University of Montana, Office of Research Administration for their contribution of indirect costs to this study. Alan Watson of the Aldo Leoplod Wilderness Research Institute was particularly helpful with OMB assistance. Special Thanks goes to Mae Davenport, who diligently implemented this study plan.

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About the Study

The goal of this research project was to gain information about Yellowstone National Park (YNP) winter visitors experience, values, motivations, management action support and to evaluate visitor travel dynamics. Winter recreation use in Yellowstone National Park (YNP) has dramatically increased over the past three decades, imparting various challenges to park management. Many social issues such as overcrowding, visitor conflicts, and visitor behavior have been identified by management as central concerns (Greater Yellowstone Coordinating Committee 1997). Visitors themselves have expressed contrasting concerns related to the impacts of motorized use on their winter experience. This study, in response to these challenges, investigates the social impacts of snowmobile use in YNP and examines the questions: Who are YNP's winter visitors and why did they visit YNP? What are visitor evaluations of current social conditions? Are potential management actions consistent with the motivations and satisfaction of visitors?

The Yellowstone National Park Winter Use Project encompasses three phases of research. Phase I was initiated in the 1996-1997 winter season. This study was essentially a preliminary assessment of indicator importance and data collection for travel pattern modeling. The main objectives of this phase was to examine visit and visitor characteristics, to identify components related to experience quality, and to collect visitor travel pattern data. Travel pattern data was necessary to create the model used in the 1998 Winter Survey (Borrie et al, 1998). The model is basically a simulation tool that estimates real-life traffic conditions of oversnow vehicles in the Park. For the purposes of this research it documented the existing conditions in the Park and allowed the generation of realistic scenarios for visitors to evaluate. The study conducted in the winter season of 1997-1998 and presented in this report is Phase II of the Winter Use Project. Phase III data collection was conducted in the winter season of 1998-1999 and that analysis is currently underway.

Study Methods

The goal of this research project (phase II of the Yellowstone National Park Winter Use Project) was to gain information about Yellowstone National Park (YNP) winter visitors' experience, values, motivations, their support for a range of management actions and to evaluate visitor travel dynamics. Data were collected in three different forms: mail-back questionnaires, on-site surveys, and hourly oversnow vehicle counts.

Mail-back Questionnaire

The bulk of the information gathered from YNP winter visitors was from the mail-back questionnaires (Appendix A). For this study 1818 winter visitors to Yellowstone National Park were contacted at the four entrances to the Park, including the North (Mammoth), East (Cody), South (Flagg Ranch) and West (West Yellowstone) entrances. Names and addresses of visitors were collected, voluntarily, on thirteen randomly selected days in January, February, and March of the 1997-1998 winter season. Visitors were sampled on weekends, as well as weekdays to encompass days of high and low-use. Visitors were sampled by a systematic random sample of the four entrances. Sample size at each entrance was proportionately representative of the number of visitors expected to be entering at each site. A random sample of 1505, approximately fourteen percent of the total visitors through each entrance, were mailed a questionnaire (Appendix A). The initial mailing and subsequent reminders yielded a response rate of seventy-one percent or 1064 questionnaires returned.

Onsite Survey

Short onsite surveys were also conducted at two sites in the interior of the park (Appendix B). Old Faithful visitor center and the Fishing Bridge warming hut were selected for their diversity of location and visitation. Old Faithful is a high-use area and the Fishing Bridge has relatively low-use. Surveys at Old Faithful

occurred on February 12, 13, and 27. Visitors at the Fishing Bridge were surveyed on January 30 and 31, February 14, 15, and 28, as well as March 1st. Visitors surveyed include those travelling by snowcoach and snowmobile. Two hundred and eight interviews were conducted; forty-seven percent at the Fishing Bridge warming hut and fifty-three percent at the Old Faithful visitor center.

Hourly Snow Vehicle Counts

Hourly counts of snowmobiles and snowcoaches were conducted at two sites in the interior of the Park and at the four entrances. At the two interior sites on groomed roadways just west of the West Thumb warming hut and south of Madison Junction counts were recorded for snow vehicles travelling in each direction for two hour blocks. Interior counts occurred on three days at each site. Counts conducted at the four entrances recorded the numbers of vehicles entering and exiting the Park from 7:00 am to 6:00 pm. These counts took place on four days in January, February, and March. These data collected have been used primarily to verify the model used in mapping visitor travel dynamics.

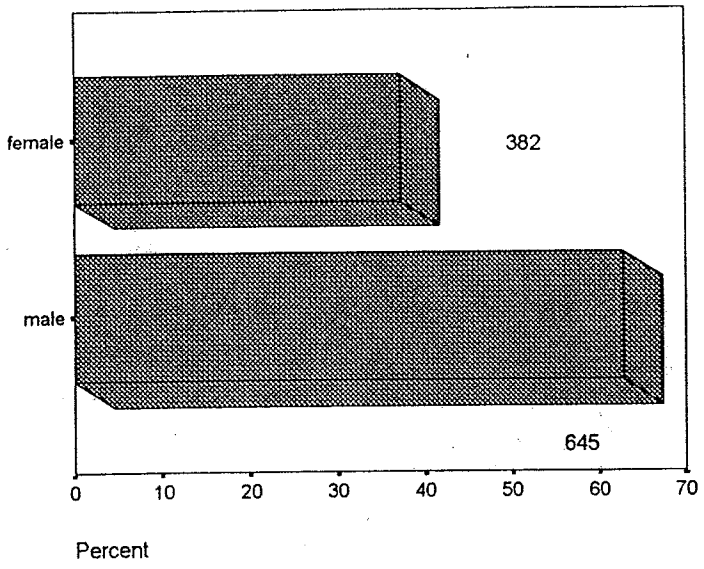
Who Are Yellowstone National Park's Winter Visitors?

Respondent Demographic Characteristics

Overall, respondents can be characterized as visitors who are highly educated and relatively wealthy. A typical respondent might be a middle-aged male who grew up and now lives in communities with a population between 5,000 and 50,000.

Gender

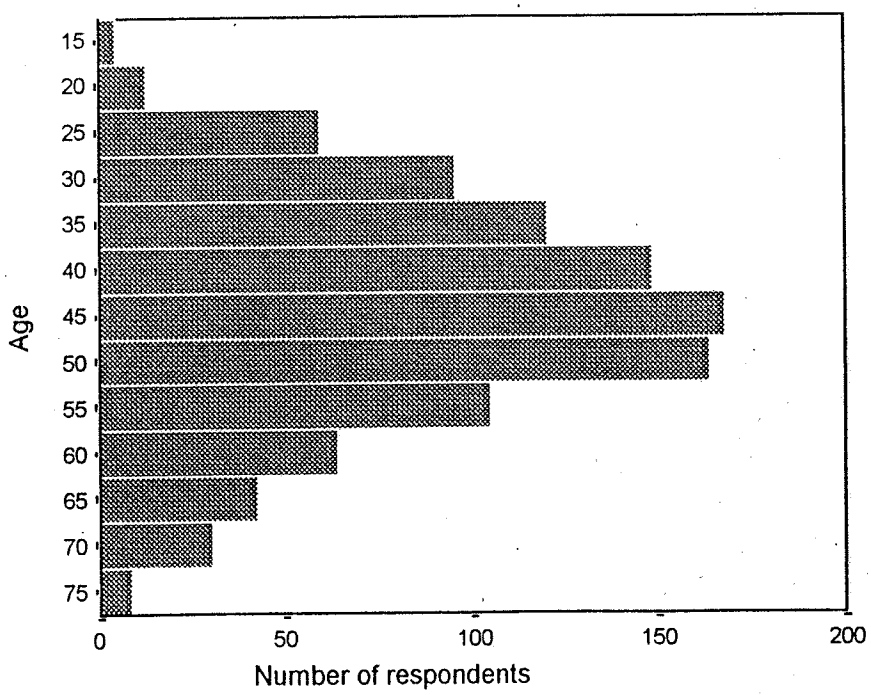
Figure 1. Gender of respondents n=1027



Sixty-three percent of the respondents were male.

Age

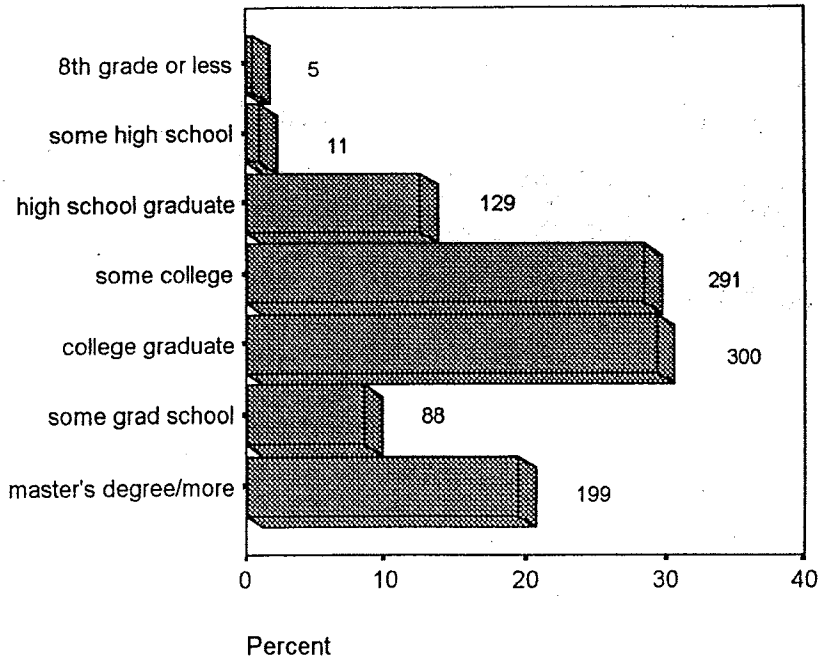
Figure 2. Number of respondents in each age group
n=1022



The average age of the respondents to the questionnaire was forty-five years old.

Education

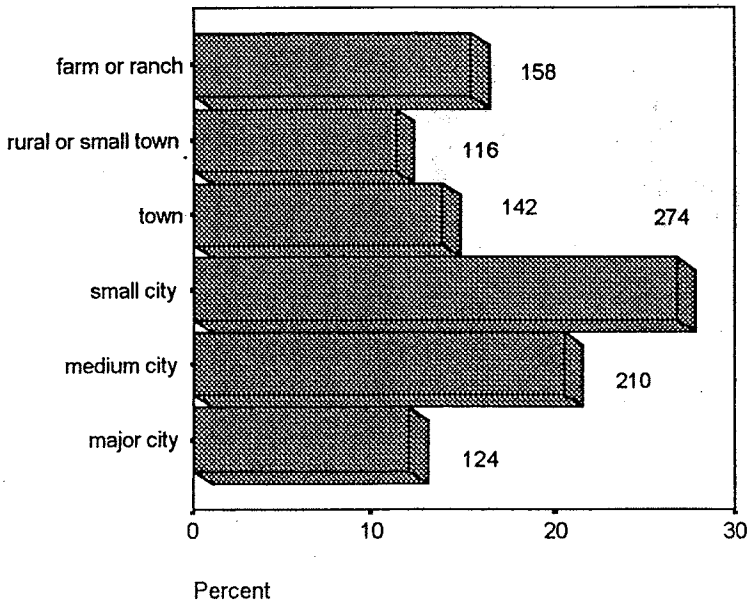
Figure 3. Level of education completed by respondents
n=1023



Over fifty-four percent of respondents were college graduates.

Type of Community Growing Up

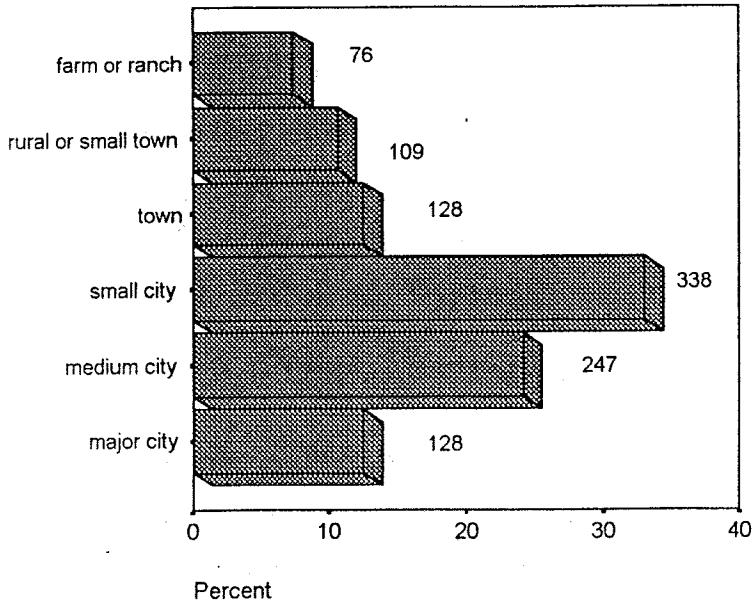
Figure 4. Percentage of respondents growing up in each type of community
n=1024



Fifty-nine percent of respondents grew up in community with a population of 5,000 or larger.

Type of Community Living in Now

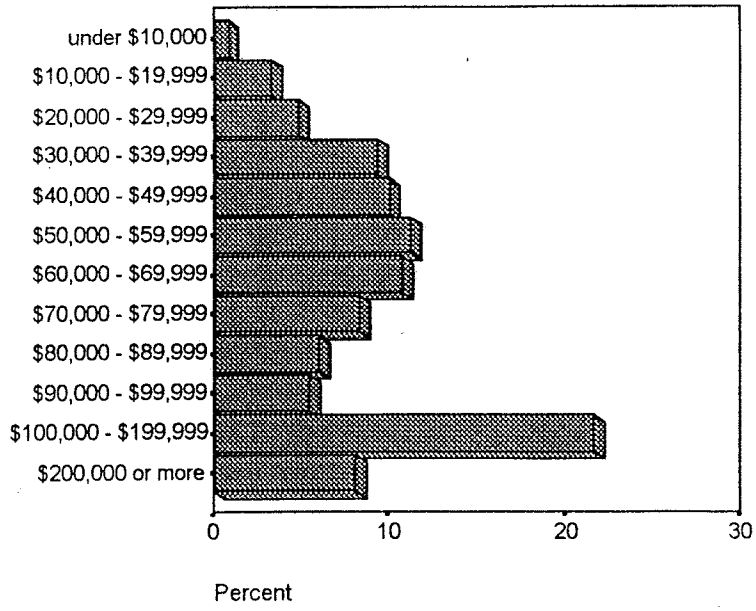
Figure 5. Percentage of respondents now living in each type of community n=1026



Almost 70 percent of respondents now live in a community with a population of 5,000 or more.

Household Income

Figure 6. Percentage of respondents within each household income level n=963



The average household income of respondents fell between $60,000 and $79,999. Thirty percent of respondents garner a household income of $100,000 or more.

Respondent Trip Characteristics

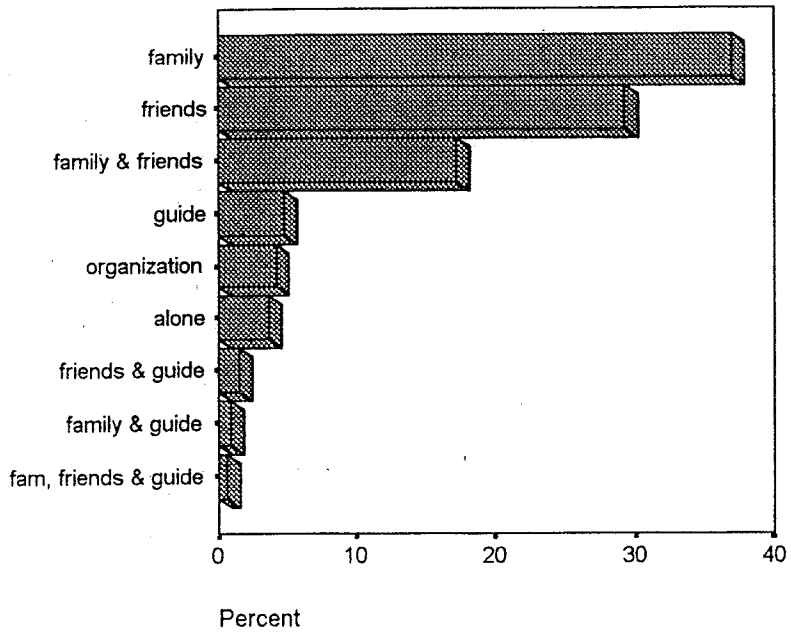
Taken together, respondents can be characterized as visitors traveling with friends or family, primarily on rented snowmobiles. Most respondents entered YNP through the West entrance and visited the Park for one or two days. The majority of respondents who stayed over night did so in a hotel or motel outside but near the vicinity of the Park (most commonly in West Yellowstone). Just over half of the respondents also snowmobiled or skied in areas outside YNP. Most respondents who recreated in these other areas did so for one to three days. Respondents rated themselves on average as having moderate skills as winter recreationists.

Many similarities are found when the trip characteristics of respondents from this study are compared to Littlejohn's 1995 study of YNP visitors (Littlejohn 1996). In both studies approximately forty-five percent of respondents visited YNP for only one day or less than one day. Littlejohn reported that seventy-four percent of respondents traveled through the Park by snowmobile and twelve percent of her sample used a snowcoach. These data are supported by this study's findings in which seventy-seven percent of respondents used a snowmobile and eleven percent used a snowcoach.

In terms of entrance site, just over sixty percent of respondents from this study used the West entrance, while nineteen percent used the South entrance. This is consistent with statistics presented in YNP's winter report (YNP 1997) which also found the West and East entrances as the most popular at sixty-eight and twenty-three percent, respectively.

Type of Group

Figure 7. Percentage of respondents visiting YNP in each group type* n=1052

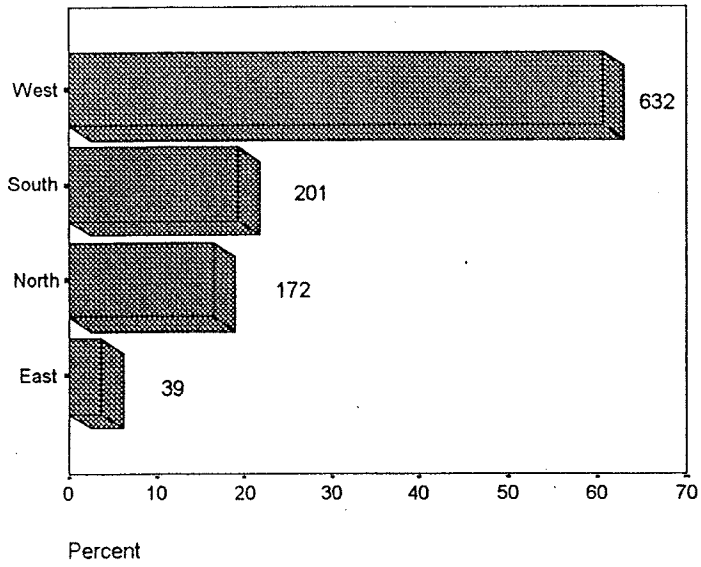


Over eighty-three percent of respondents were with family, friends or both on their visit. Eight percent were on a guided trip.

*respondents in other categories represent less than 2.0%.

Entrance

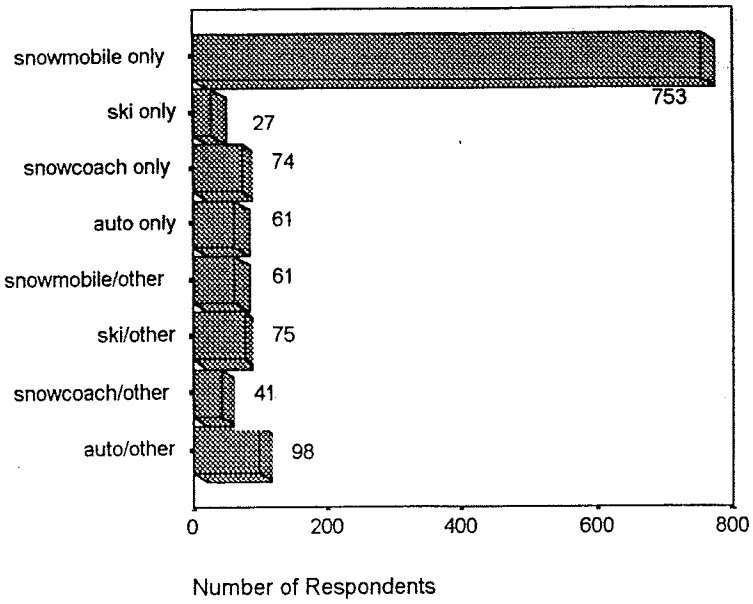
Figure 8. Percentage of respondents entering YNP through each site n=1044



The majority of respondents, over sixty percent, entered YNP at the West entrance. Nineteen percent entered at the South entrance, over sixteen percent at North, and only four percent entered at the East entrance.

Mode of Transportation

Figure 9. Primary modes of transportation of respondents*
n=1055

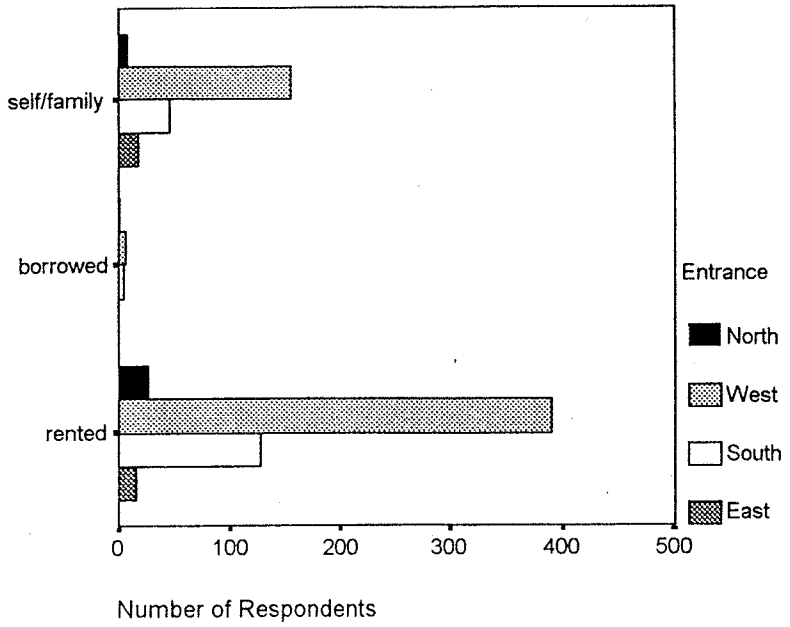


Over seventy-one percent of respondents visited YNP on snowmobile only. Fifteen percent primarily visited YNP by car only or visited by car and used other modes such as skies, snowcoach, or snowmobile.

*"Only" categories mean that respondents only used this mode of transportation. "Other" categories mean that respondents used this mode of transportation and at least one other form. Respondents may be in more than one category.

Snowmobile Ownership

Figure10. Snowmobile ownership of those respondents who visited YNP on snowmobile by entrance* n=803

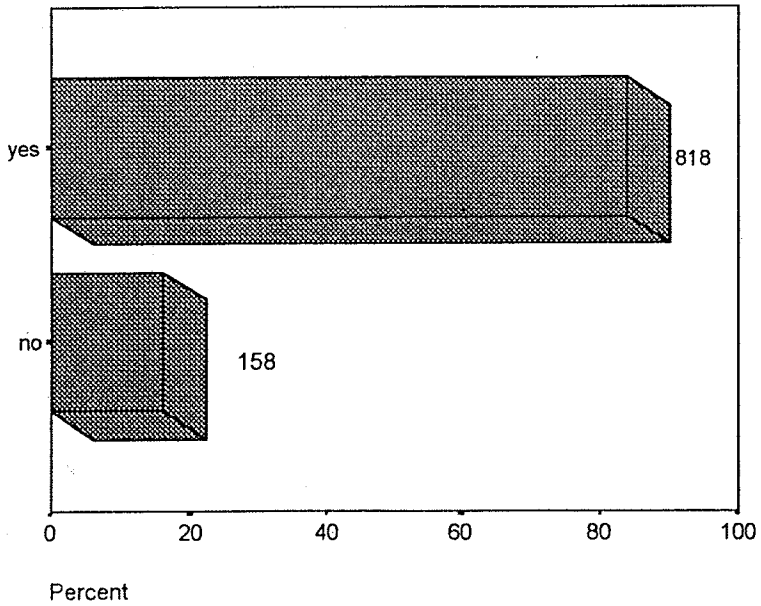


Over seventy percent of respondents entering YNP at the North, West and South entrances rented their snowmobiles. Only forty-four percent of respondents at the East entrance rented; fifty percent owned their own.

*respondents in other categories represent less than 1%.

Overnight Accommodations

Figure 11. Percentage of respondents staying in the vicinity of YNP n=976



Eighty-four percent of respondents stayed in the vicinity of YNP.

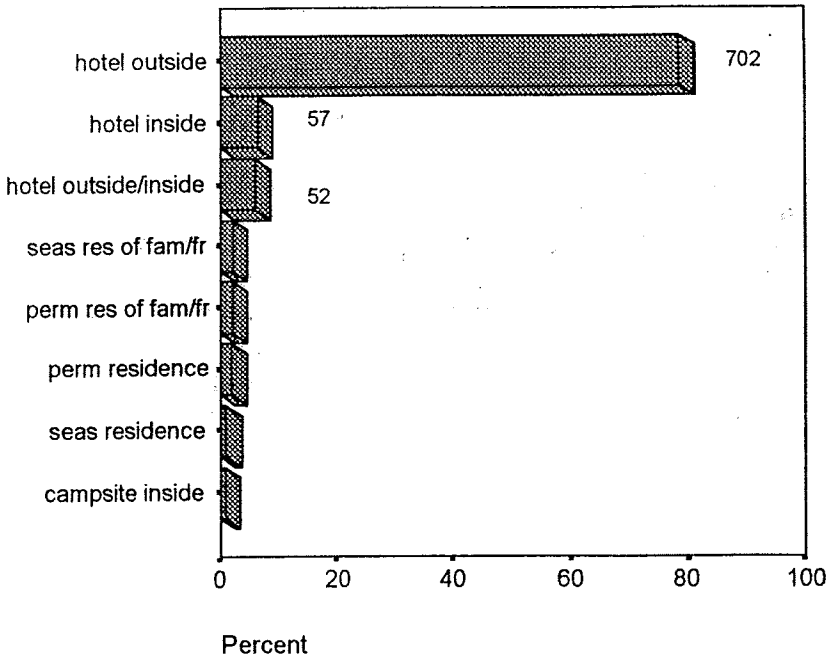
Table 1 Ten most common locations of overnight accommodations of those who stayed in the vicinity of YNP

location	number	*percent of respondents (n=819)
West Yellowstone	467	57.0%
Gardiner	63	7.7%
Jackson	57	7.0%
Big Sky	42	5.1%
Flagg Ranch	41	5.0%
Mammoth	41	5.0%
Old Faithful	36	4.4%
Bozeman	18	2.2%
Pahaska Teepee	18	2.2%
Island Park	15	1.8%

*Includes only those who stayed in the vicinity of YNP

Forty-four percent of all respondents spent a night in West Yellowstone on their visit to YNP.

Figure 12. Type of lodging of respondents*
n=894

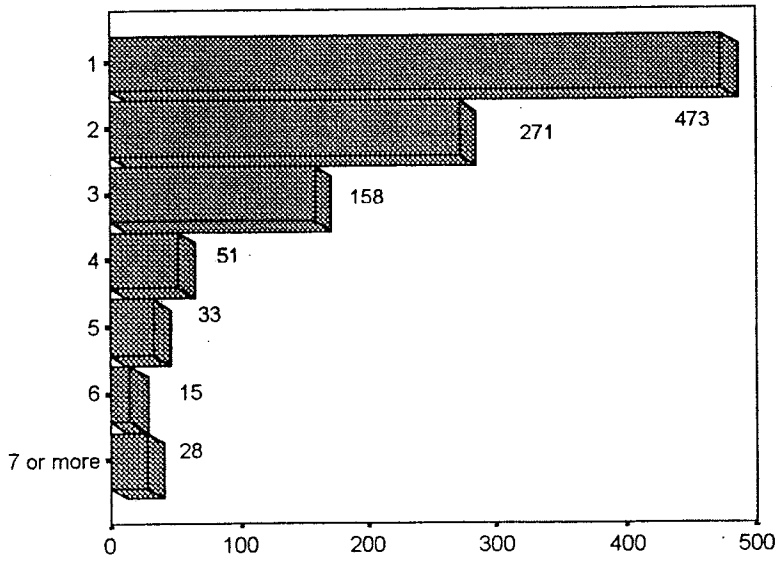


The majority of visitors, over seventy-eight percent spent the night in a hotel or motel outside YNP only. Twelve percent spent at least one of the nights in a hotel inside the Park.

*respondents in other categories represent less than 2.0%.
"seas" refers to seasonal, "res" refers to residence, and "fam/fr" refers to family/friends.

Number of Days in YNP

Figure 13. Number of days respondents spent inside YNP* n=1042



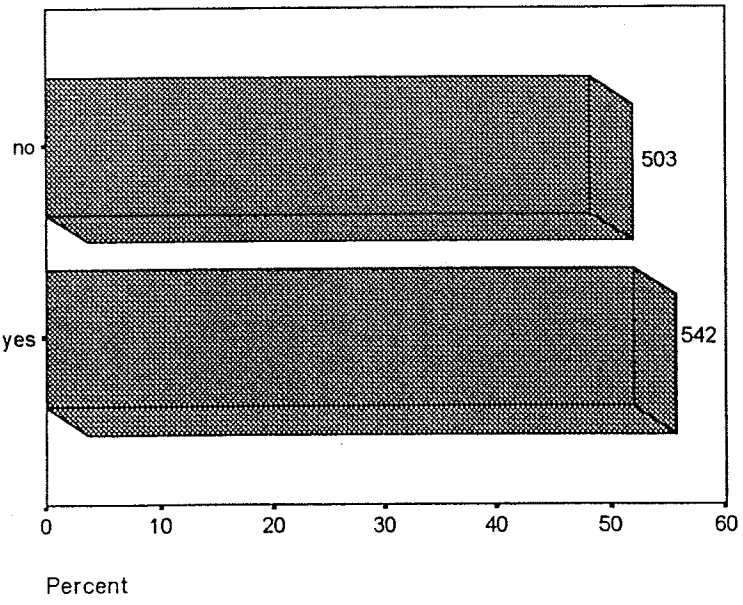
Fifty-five percent of respondents spent more than one day inside YNP. Seven percent spent five or more days inside the Park.

*respondents in other categories represent less than 2.0%.

Recreation in Other Areas

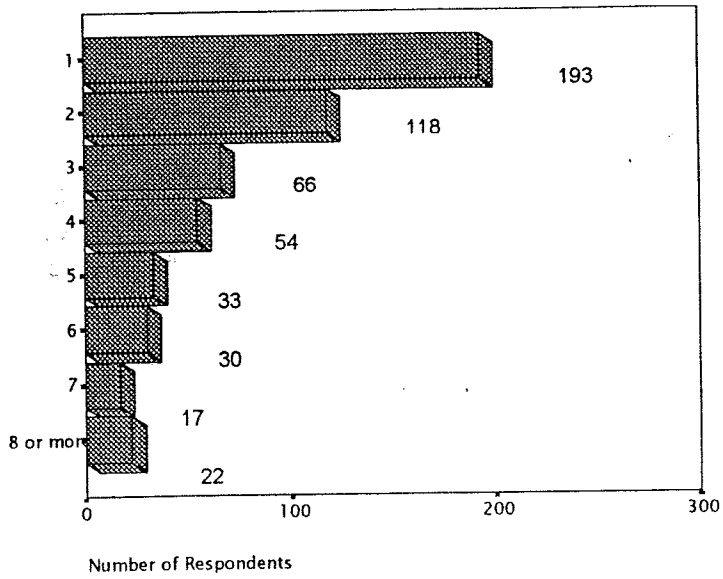
Figure 14. Percentage of respondents who snowmobiled or skied in other areas on their trip

n=1045



Fifty-two percent of respondents snowmobiled or skied in areas other than YNP on their trip.

Figure 15. Number of days respondents recreated in areas outside YNP*
n=534



Over forty-one percent of respondents who recreated outside of YNP did so for more than two days.

*respondents in other categories not represented here make up less than 1.0%.

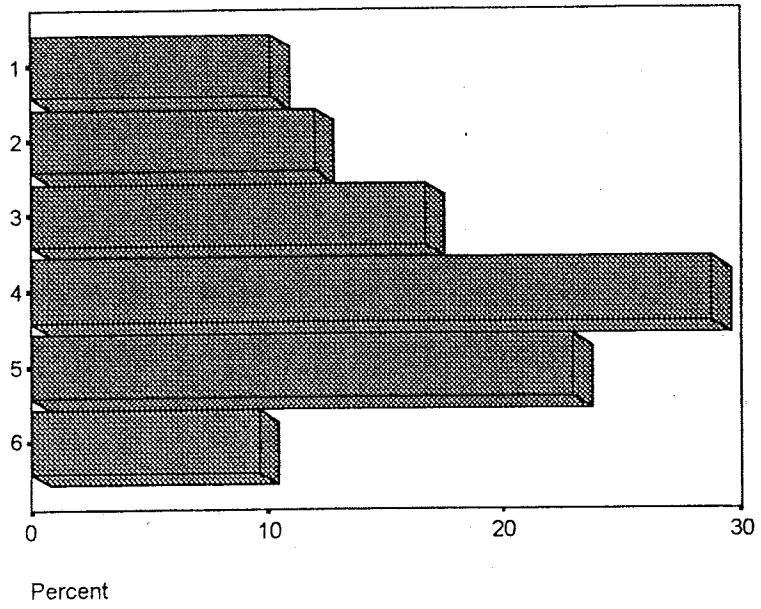
Table 2. Ten most common locations of recreation of those respondents who recreated outside YNP.

n=391

location	number	percent of sample (n=1064)
Two Top	57	5.4%
Big Sky	55	5.2%
West Yellowstone trails	54	5.1%
National Forests (general)	45	4.2%
Targhee NF	43	4.0%
Jackson	38	3.6%
Gallatin NF	32	3.0%
Grand Teton NP	30	2.8%
Island Park	23	2.2%
Trails outside YNP	14	1.3%

Skill Level

Figure 16. Respondent self-rating of skill level as a winter recreationist. n=1012



Respondents had an average skill level of 3.71. Over thirty-two percent reported a skill level in the expert range (five and higher).

*On a scale of one to six (one=beginner, six=expert)

Why Did Respondents Visit Yellowstone National Park?

YNP Values, Visitor Motivation and Experience Satisfaction

Exploring the values visitors place on Yellowstone National Park, identifying reasons visitors come to the Park, and examining visitor satisfaction with their Yellowstone experience are all ways in which managers can better provide opportunities for quality experiences to a diverse group of visitors. In this study these aspects of the relationship between visitors and YNP's winter setting serve as tools for which we characterized visitor groups and analyzed how these groups responded to particular conditions and proposed management actions. In this section we describe how we measured the values visitors place on YNP, reasons visitors come to YNP, and visitor satisfaction with their experience. We provide tables of descriptive statistics that demonstrate the overall ratings of the

items we asked respondents to consider. Finally we illustrate how visitors can be segmented according to their reasons for visiting the Park.

Measurement of the Values Visitors Place on Yellowstone National Park

Visitors place a wide variety of values on YNP. Many have different opinions about the role the Park should serve. Exploring these philosophical values can help managers to understand what visitors expect from their experience and from the way in which YNP is managed. Gaining insight into the values visitors deem important to YNP, offers managers a new perspective and may influence the direction of future management.

The items for this inquiry were developed from a discussion of the historical origins of the park idea. The items represent properties of seven different broad categories of values commonly associated with national parks. These items were then randomly sorted within the question. Respondents were asked the extent to which they agreed or disagreed with each of the items importance to the overall value of YNP. The scale ranged from one to eight, one being "strongly disagree" and eight being "strongly agree". Table 3 shows the means, medians, and standard deviations of each of the items in descending order. All in all, respondents believe that YNP is highly important as a place for scenic beauty, wildlife protection, and as a place everyone needs to see. According to visitors, the Park's role as an economic resource, a place to be free from society's rules and regulations, and a place to develop skills are the least important of all of the values given, although the standard deviations suggest a great deal of variability among respondents on these items.

Table 3. Values respondents place on YNP.

YNP Values	N	Mean	Med.	Std. Dev.
Scenic beauty	1049	7.68	8	1.06
Everyone should see at least once	1044	7.28	8	1.57
Wildlife sanctuary	1055	7.27	8	1.45
Protection for fish and wildlife habitat	1050	7.19	8	1.42
Display of natural curiosities	1035	7.06	8	1.41
Education about nature	1042	7.02	8	1.42
Use and enjoyment of the people	1050	6.96	8	1.60
Historical resource	1044	6.91	8	1.50
All living things to exist	1039	6.89	8	1.73
Wildness	1014	6.88	8	1.84
Symbol of America's identity	1046	6.85	8	1.66
Without most types of commercial development	1037	6.77	7	1.66
Protector of threatened species	1032	6.75	8	1.82
Recreational activities	1046	6.40	7	1.69
Scientific research and monitoring	1032	6.36	7	1.72
Tourist destination	1041	6.21	7	1.80
Renew your sense of personal well being	1025	6.14	7	1.88
Family or individual tradition	999	5.62	6	2.10
Reserve of natural resources for future use	1020	5.43	6	2.64
Sacred place	1004	5.36	6	2.49
Social place	1028	4.72	5	2.11
Economic resource	999	4.52	5	2.29
To be free from society and its regulations	1021	4.28	5	2.42
Develop my skills and abilities	1000	4.20	4	2.01

8 pt. scale: 1=strongly disagree, 8=strongly agree, med = median, Std. Dev = standard deviation

A place for scenic beauty, a wildlife sanctuary, and protection for fish and wildlife habitat were among the top five values respondents ascribed to YNP.

Measurement of the Reasons for Visiting Yellowstone National Park

One of the objectives of this study was to identify what motivates people to visit YNP and how these motives are linked to satisfaction and support for management actions. This type of analysis depends on the selection of a wide range of motivations with which visitors could identify. Scale items were adapted from extensively tested Recreation Experience Preference (REP) scales (Driver 1970) and a similar study examining winter recreationists to Voyageurs National Park (Lime et al 1997). When paired with motivation, an analysis of satisfaction elucidates what experiences visitors feel are important and how satisfying that experience was. Thus, we asked for both importance and satisfaction for each item.

The motive/experience items were randomly sorted within the question. Respondents were asked to rate the importance of each reason to them and their visit to YNP. The five point scale provided ranged from one, "very unimportant" to five, "very important". Respondents then identified for each item how satisfied they were with that experience. The satisfaction scale ranged from one, "not at all satisfied" to four, "totally satisfied". Table 4 illustrates the means, medians, standard deviations, and ranks of each of the items.

At a glance, the table shows that the items held a wide range of importance according to respondents. Importance medians range from unimportant (2) to very important (5). The medians for satisfaction indicate that overall visitors were generally satisfied with their experiences in the Park. The medians here ranged from moderately satisfied (3) to totally satisfied (4). According to the means and subsequent ranks, natural scenery, wildlife, having fun, and viewing bison are the most important reasons respondents visited YNP. Of least importance to respondents was, developing skills, becoming more productive at work, and escaping family. Respondents were also relatively very satisfied with these experiences.

The ranks and the rank differences from Table 4 reveal items that may be of most interest to management, those that are highly important to respondents, but garner relatively lower satisfaction. These items have highly negative rank differences. Three items, experiencing tranquility, peace and quiet, and getting away from crowds, fall into this category. This suggests that while visitors are coming to YNP to find tranquility, peace and quiet, and to escape crowds, at least some of them are relatively less satisfied with what the Park offers in these areas. Conversely, respondents view being with their group and having thrills relatively unimportant, but are proportionately more satisfied with having achieved these ends (as reflected in the high positive rank differences).

Table 4. Respondent ratings of reasons/experiences in importance and satisfaction.

Reason/Experience	Importance				Satisfaction				
	Mean	Med.	Std. Dev.	*R.	Mean	Med.	Std. Dev.	R.	**R. Diff.
Enjoy natural scenery	4.77	5	0.57	1	3.89	4	0.36	1	0
View wildlife	4.63	5	0.62	2	3.73	4	0.53	4	-2
Have fun	4.37	4	0.75	3	3.77	4	0.47	2	1
View bison in natural setting	4.22	4	0.91	4	3.69	4	0.63	6	-2
Get away from the usual demands of life	4.22	4	0.91	5	3.73	4	0.54	5	0
Experience the tranquility	4.18	4	0.92	6	3.46	4	0.79	18	-12
Snowmobile or ski in wild/natural setting	4.15	4	1.13	7	3.67	4	0.66	8	-1
Experience new and different things.	4.07	4	0.87	8	3.64	4	0.56	9	-1
Do something with family	4.06	4	1.18	9	3.75	4	0.57	3	6
Have adventure	4.03	4	0.92	10	3.61	4	0.61	11	-1
Learn more about nature	4.01	4	0.91	11	3.54	4	0.64	13	-2
Learn about natural history	3.97	4	0.92	12	3.49	4	0.68	16	-4
See Old Faithful	3.95	4	1.1	13	3.58	4	0.76	12	1
Experience peace and quiet	3.79	4	1.12	14	3.28	4	0.87	25	-11
Be with people who enjoy same things	3.78	4	1.13	15	3.63	4	0.61	10	5
Be with members of my own group	3.75	4	1.22	16	3.69	4	0.56	7	9
Get away from crowds	3.67	4	1.15	17	3.10	3	0.96	40	-23
Do something creative	3.66	4	1.06	18	3.51	4	0.70	15	3
Experience excitement	3.59	4	1.08	19	3.48	4	0.69	17	2
Bring my family/group closer together	3.57	4	1.25	20	3.53	4	0.69	14	6
Experience solitude	3.51	4	1.2	21	3.25	3	0.87	29	-8
Learn more about cultural history	3.47	4	1.06	22	3.26	3	0.77	28	-6
Feel healthier	3.44	4	1.2	23	3.39	4	0.77	19	4
Be in an area where wolves exist	3.43	4	1.4	24	3.25	4	0.92	30	-6
Help reduce tension	3.24	3	1.28	25	3.38	4	0.8	21	4
Allow my mind to move at slower pace	3.23	3	1.28	26	3.37	4	0.81	22	4
Promote greater environmental awareness in own group	3.19	3	1.27	27	3.36	4	0.79	23	4

Table 4. continued

Reason/Experience	Importance				Satisfaction				
	Mean	Med.	Std. Dev.	*R.	Mean	Med.	Std. Dev.	R.	**R. Diff.
Be challenged	3.12	3	1.12	28	3.33	3	.7	24	4
Have Thrills	3.09	3	1.22	29	3.39	4	.7	20	9
Reflect on and clarify personal values	3.04	3	1.18	30	3.27	3	0.8	26	4
Share what I have learned with others	3.01	3	1.24	31	3.27	3	0.81	27	4
Keep physically fit	2.92	3	1.17	32	3.2	3	0.85	34	-2
Talk to new and varied people	2.84	3	1.09	33	3.23	3	0.8	31	2
Rest physically	2.8	3	1.15	34	3.21	3	0.85	33	1
Feel more self-confident	2.76	3	1.17	35	3.23	3	0.84	32	3
Be at a place where I can make own decisions	2.69	3	1.21	36	3.11	3	0.91	37	-1
Help others develop skills	2.66	3	1.19	37	3.13	3	0.85	36	1
Develop skills	2.58	3	1.08	38	3.2	3	0.82	35	3
Be more productive at work	2.51	3	1.18	39	3.11	3	0.89	38	1
Escape family temporarily	2.11	2	1.13	40	3.11	3	0.98	39	1

*Rank by Means; **Rank difference between importance and satisfaction means; Importance: 1=Very important, 2=unimportant, 3=neither important or unimportant, 4=important, 5=very important; Satisfaction: 1=not at all satisfied, 2=somewhat satisfied, 3=moderately satisfied, 4=totally satisfied

Factor Analysis of Motive Scores

The importance ratings from the forty motive items were analyzed to reveal whether a simpler underlying structure could represent the motives. This was done by performing a principal component factor analysis. Reducing the number of variables in this manner provided us with a statistically more dependable measurement of reasons why visitors came to YNP. This procedure revealed six different underlying factors which we labeled according to their fundamental themes. These factors are shown in Table 5. These factors serve as summaries of the forty motives and will then be used to group respondents according to their scores on these factors.

Table 5. Factor summaries.

Factor 1: Self-help and Reflection	**Factor 2: Learning and Nature**
Help reduce tension	Learn more about natural history
Allow mind to move more slowly	Learn more about nature
To make own decisions	Learn more about cultural history
Be more productive	View bison in nature
Reflect on values	View wildlife
Feel more self confident	
Feel healthier	
Help others develop skills	
Factor 3: Solitude, Peace, and Quiet	**Factor 4: Thrills and Spills**
Get away from crowds	Experience excitement
Experience peace and quiet	Have thrills
Experience the tranquility	Have adventure
Experience solitude	Have fun
Enjoy natural scenery	
Factor 5: Skills and Fitness	**Factor 6: Family and Friends**
Keep physically fit	Be with members of my own group
Develop skills	Do something with family
Be challenged	Bring my family/group closer together
	Be with people who enjoy same things

Factor one, Self-help and Reflection, can best be characterized as the desire to attend to personal needs, like reducing tension, feeling healthier, and self-

reflection. This factor represents a more introspective motivation, including decision-making and self-confidence. Factor two, Nature and Learning, can be described as motivations to learn about the natural and cultural history of the Park. This category includes viewing and learning about wildlife and nature. The third factor, Solitude, Peace, and Quiet, depicts motivations that are related to getting away from crowds, noise, and the hustle and bustle of everyday life. Experiencing natural scenery is also included in this factor. Opportunities for adventure and fun are fundamental to factor four, Thrills and Spills. This category includes thrill seeking and the desire to experience excitement. Motivations in factor five, Skills and Fitness, include physical challenge, skill development and keeping fit. The final factor, Family and Friends, emerged as the category representing social motivations. Items inherent in this factor include being with members of own group, bringing family or group closer together, and being with people who enjoy the same things.

Defining Respondent Groups by Motivations for Visiting YNP

The six factors identified through factor analysis can be used to discern different groups or clusters of respondents according to their motivations. This was executed through cluster analysis. Cluster analysis is a statistical procedure which isolates respondents into groups, in this case with respect to their motives for visiting YNP. Eighty-one percent (n=867) of the respondents were used in this analysis. Our analysis identified the four clusters, based on respondents' motives for visiting the park. We labeled these clusters Personal Growth, Nature Study, Quiet Activity, and Accidentals, based on their predominant motives. Table 6 illustrates the four clusters and their variances for the six factors.

Table 6. **Clusters**

	Personal Growth	Nature Study	Quiet Activity	Accidentals
Factor	Mean	Mean	Mean	Mean
Self-help and Reflection	.6878	-.9555	-.6679	.3875
Learning & Nature	.3007	.6512	-.6698	-1.2879
Solitude, Peace & Quiet	.1058	-.4287	.9308	-1.2768
Thrills & Spills	.1850	-.2603	.0636	-.4594
Skills & Fitness	.1146	-.7126	.3952	.1128
Family & Friends	.0583	-.1705	.0915	-.4437

The Personal Growth cluster represents those respondents who rated items in the Self-help and Reflection factor as highly important to them or to their visit. Thirty-eight percent of respondents can be classified in this motive cluster. While the reflection and introspection are primary reasons respondents in this group came to YNP, they also rated the motivation items in the Learning and Nature category moderately high. Overall, these visitors are motivated to experience personal gains, in terms of feeling healthier, reducing stress, and learning about their environment. The social aspect of visiting Yellowstone, for example being with family or friends, is not as important to them.

Table 6 illustrates that learning about their environment is the fundamental reason why visitors in the Nature Study cluster came to YNP. Learning about the natural and cultural history of the Park, as well as viewing bison and other wildlife in their natural setting are highly important aspects of their visit. This cluster represents eighteen percent of respondents.

Visitors in the Quiet Activity cluster, seventeen percent of respondents, seek solitude, tranquility and quiet in a physically challenging environment. These visitors come to YNP to maintain personal fitness and develop their skills away from crowds and noise.

Respondents in the final cluster, Accidentals, did not rate any of the factors particularly high. They did show some motivation for reducing tension, feeling healthier, and becoming more productive, included in the Self-help and

Reflection factor. These visitors are labeled Accidentals since they don't seem to share the same types of motivations found in most recreationists. Perhaps, other factors not specific to the experiences found in YNP motivated them to visit, or our group members made the decision to visit and their own motivations are not particularly tied to YNP. Over eight percent of respondents are represented by the Accidentals motive cluster.

Cluster Demographic Characteristics

Once the clusters were identified, these segments were analyzed according to their demographic characteristics. This analysis was performed to establish what the clusters have in common and what the major differences are between clusters. A descriptive analysis and Chi-Square test of significance ($\alpha<.05$) revealed that with respect to sociodemographic characteristics, respondents across segments have much in common. No significant differences between clusters were detected in age, type of community growing up, type of community living in now, or income. However, significant differences did surface between clusters in gender ($p<.001$) and education ($p<.05$). Fifty-four percent of the female respondents included in the cluster analysis are represented by the Personal Growth segment, while less than forty-two percent of male respondents of the clusters can be characterized by this segment. On the other hand, the Nature Study cluster comprises a greater proportion of the male respondents than female respondents included in the analysis. A higher percentage of male respondents than female respondents are also represented by the Accidentals. Only slight differences were detected between clusters in education.

Motivation Clusters and Management Implications

Motivations are the basis upon which the factors and clusters in this study were designed. The four clusters, Personal Growth, Nature Study, Quiet Activity, and Accidentals are essentially crystallized representations of the respondents and

their motivations. Examining these motive clusters and their association with choices or behaviors such as the entrances and transportation modes respondents chose can help management understand the kinds of experiences sought by visitors in different regions of the Park. For example, it would be useful to know what skiers at the North entrance seek versus snowcoach riders from West or snowmobilers from the East entrance.

Figure 17 illustrates the striking differences between clusters according to the entrance they used. Almost fifty-four percent of clustered respondents entering YNP in the North are represented by the Quiet Activity cluster, while less than sixteen percent of these clustered respondents used the West entrance. The Nature Study segment encompasses twenty-six percent of clustered respondents from the South entrance, but less than twelve percent of clustered respondents entering in the East. Figure 18 reveals the differences between motive clusters in whether or not they snowmobiled while in the Park. The Personal Growth and Accidentals groups have a greater proportion of snowmobilers, while the Nature Study and Quiet Fitness clusters represent more skiers, snowcoach riders and visitors travelling by automobile.

Figure 17. Percentage of respondents within each cluster by entrance

n=853

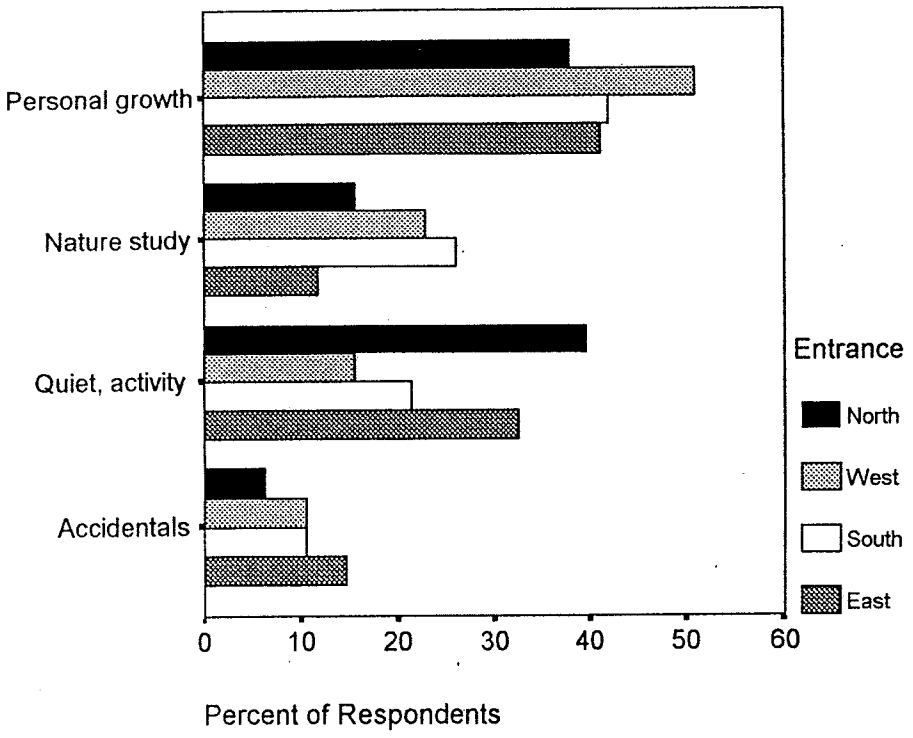
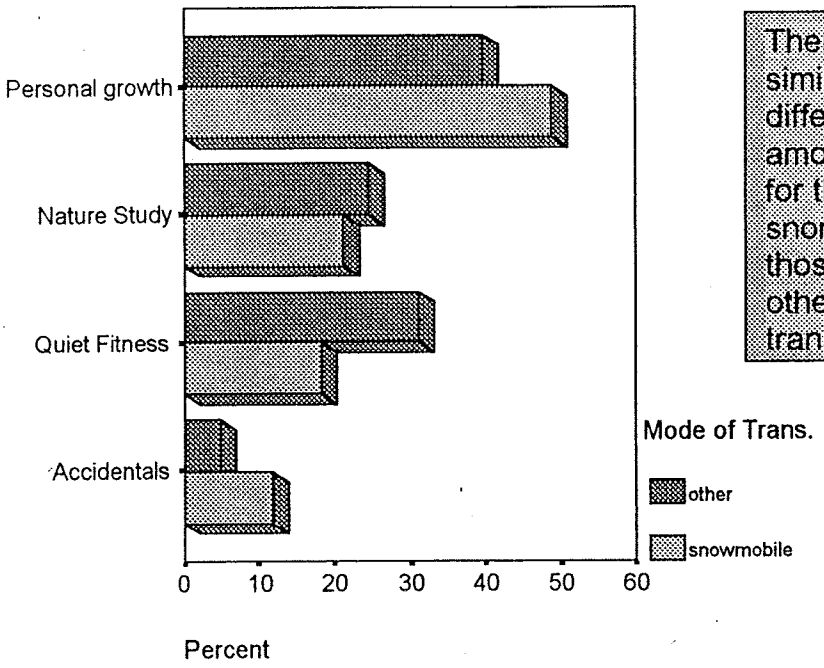


Figure 18. Respondent motive cluster membership for those who snowmobiled compared to those who used only other modes of transportation.

n=859



There are more similarities than differences among among the motivations for those who snomobile in YNP and those who only use other modes of transportation.

How Does Motivation Affect Visitor Assessment of the Park?

Analyzing Motive Cluster Differences in Experience Satisfaction

Table 7 shows that taken altogether respondents were satisfied with their experiences in the Park. However, some significant differences exist across motive clusters. The following table provides the means, medians, standard deviations, and ranks of each experience item for the four motive clusters. The forty experience/motive items are ordered in descending order according to the mean of the Personal Growth cluster. The means and medians from the four point satisfaction scale are concentrated within moderate (3) to total satisfaction (4) for each of the motive clusters. Enjoying natural scenery garners the highest satisfaction mean in each of the segments. Clusters are also very similar in their satisfaction with having fun, their snowmobiling or skiing experience, and the opportunity to do something with family. Getting away from crowds is ranked among the last three for each of the clusters.

Turning to differences, the Personal Growth group was on average, totally satisfied with the ability to get away from life's demands and the opportunity to do something with family. For the Nature Study segment, getting away from the demands of life was significantly less satisfying. These respondents were more satisfied with seeing Old Faithful than any other cluster. The Quiet Fitness respondents found significantly more satisfaction in being with members of their own group and feeling healthier than the others. The Accidentals appear to be less satisfied overall, especially with experiencing new things and doing something creative.

Table 7. **Satisfaction**

Experiences	Personal Growth				Nature Study				Quiet Fitness				Accidentals				Chi-Square	
	Mean	Med.	S.D.	*R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	χ^2	p-value
Enjoy natural scenery	3.92	4	0.28	1	3.91	4	0.31	1	3.87	4	0.44	1	3.79	4	0.47	1	20.322	0.016
Get away from demands of life	3.83	4	0.40	2	3.62	4	0.60	9	3.70	4	0.59	4	3.72	4	0.48	3	27.612	0.001
Do something with family	3.81	4	0.48	3	3.77	4	0.54	2	3.64	4	0.71	7	3.62	4	0.65	5	16.135	0.064
Have fun	3.81	4	0.42	4	3.74	4	0.52	4	3.76	4	0.48	3	3.75	4	0.46	2	6.895	0.648
View wildlife	3.81	4	0.43	5	3.73	4	0.50	6	3.63	4	0.59	10	3.53	4	0.62	7	33.599	<.001
View bison in natural setting	3.78	4	0.49	6	3.74	4	0.57	5	3.58	4	0.71	11	3.40	4	0.81	11	34.012	<.001
Snowmobile or ski in wild/natural setting	3.74	4	0.57	7	3.60	4	0.75	11	3.68	4	0.69	5	3.56	4	0.79	6	10.673	0.299
Experience new things	3.72	4	0.49	8	3.63	4	0.55	8	3.66	4	0.56	6	3.31	3	0.75	14	45.785	<.001
Have adventure	3.68	4	0.54	9	3.61	4	0.60	10	3.64	4	0.58	8	3.36	4	0.79	12	27.083	0.001
Be with members of own group	3.68	4	0.52	10	3.64	4	0.69	7	3.81	4	0.43	2	3.63	4	0.57	4	25.219	0.003
Bring my family/group closer together	3.68	4	0.55	11	3.38	4	0.84	17	3.38	4	0.76	17	3.42	4	0.65	8	40.588	<.001
Be with people who enjoy same things	3.65	4	0.58	12	3.60	4	0.64	12	3.64	4	0.63	9	3.42	4	0.69	9	15.943	0.068
See Old Faithful	3.65	4	0.68	13	3.75	4	0.61	3	3.40	4	0.95	14	3.41	4	0.88	10	35.63	<.001
Do something creative	3.64	4	0.58	14	3.46	4	0.74	15	3.39	4	0.81	16	3.12	3	0.85	22	42.329	<.001
Experience excitement	3.63	4	0.57	15	3.38	4	0.74	18	3.40	4	0.74	15	3.36	3	0.74	13	29.245	0.001
Learn more about nature	3.62	4	0.56	16	3.60	4	0.63	13	3.47	4	0.69	12	3.11	3	0.74	24	46.571	<.001
Learn about natural history	3.61	4	0.61	17	3.58	4	0.60	14	3.26	3	0.73	24	3.14	3	0.87	19	66.09	<.001
Help reduce tension	3.59	4	0.63	18	3.10	3	1.02	27	3.22	3	0.76	28	3.22	3	0.78	17	72.66	<.001
Experience the tranquility in the park	3.58	4	0.71	19	3.46	4	0.81	16	3.35	4	0.88	20	3.14	3	0.85	20	30.091	<.001
Allow my mind to move at a slower pace	3.57	4	0.65	20	3.09	3	0.99	29	3.20	3	0.83	29	3.27	3	0.75	15	56.943	<.001
Feel healthier	3.54	4	0.64	21	3.08	3	0.93	31	3.43	4	0.73	13	3.14	3	0.77	21	52.286	<.001
Promote greater environmental awareness in my group	3.53	4	0.66	22	3.25	3	0.88	22	3.25	3	0.79	25	2.98	3	0.83	28	43.678	<.001
Have thrills	3.52	4	0.65	23	3.28	3	0.82	20	3.36	4	0.75	19	3.24	3	0.78	16	22.605	0.007
Experience peace and quiet	3.46	4	0.80	24	3.07	3	0.94	32	3.25	3	0.88	26	3.15	3	0.78	18	44.528	<.001
Be challenged	3.42	4	0.67	25	3.15	3	0.86	25	3.38	4	0.77	18	3.12	3	0.86	23	21.538	0.010

*Rank by means; 1=not at all satisfied, 2=somewhat satisfied, 3=moderately satisfied, 4=totally satisfied

Table 7. Satisfaction (cont'd)

Experiences	Personal Growth				Nature Study				Quiet Fitness				Accidentals					
	Mean	Med.	S.D.	*R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	χ^2	p-value
Reflect on personal values	3.41	4	0.69	26	3.12	3	0.90	26	3.28	3	0.78	21	2.98	3	0.82	29	31.834	<.001
Share what I have learned	3.41	4	0.69	27	3.22	3.5	0.95	24	3.13	3	0.82	34	2.98	3	0.89	30	34.151	<.001
Feel more self-confident	3.41	4	0.68	28	2.92	3	1.07	37	3.13	3	0.86	35	3.03	3	0.86	26	50.439	<.001
Learn more about cultural history of Area	3.40	4	0.71	29	3.38	4	0.73	19	3.02	3	0.86	39	2.92	3	0.83	35	42.181	<.001
Be in an area where wolves exist	3.40	4	0.85	30	3.24	3	0.90	23	3.15	3	0.97	32	2.98	3	1.05	31	16.309	0.061
Experience solitude	3.38	4	0.83	31	3.09	3	0.91	30	3.28	3	0.86	22	3.01	3	0.95	27	21.066	0.012
Be at a place where I can make my own decisions	3.33	3	0.78	32	2.76	3	1.09	40	3.00	3	0.94	40	2.91	3	0.86	36	47.53	<.001
Talk to new people	3.32	3	0.72	33	3.26	3	0.82	21	3.15	3	0.87	33	2.95	3	0.78	33	27.032	0.001
Develop skills	3.31	3	0.74	34	3.10	3	0.94	28	3.17	3	0.82	31	2.95	3	0.81	34	24.115	0.004
Rest physically	3.31	3	0.74	35	3.00	3	1.04	34	3.24	3	0.90	27	3.06	3	0.74	25	43.594	<.001
Help others develop skills	3.29	3	0.70	36	2.91	3	1.09	38	3.07	3	0.82	36	2.84	3	0.83	40	57.097	<.001
Be more productive at work	3.29	3	0.75	37	2.86	3	1.08	39	3.05	3	0.91	37	2.96	3	0.84	32	42.506	<.001
Keep/get physically fit	3.27	3	0.76	38	3.00	3	0.98	35	3.28	4	0.88	23	2.86	3	0.85	38	38.136	<.001
Get away from crowds	3.23	4	0.94	39	3.00	3	0.95	36	3.04	3	0.98	38	2.86	3	0.88	39	26.091	0.002
Escape family temporarily	3.19	3	0.92	40	3.03	3	1.07	33	3.19	4	0.98	30	2.88	3	0.94	37	13.115	0.157

*Rank by means; 1=not at all satisfied, 2=somewhat satisfied, 3=moderately satisfied, 4=totally satisfied

n ranges from 50 (Accidentals/Escape family temporarily) to 392 (Personal Growth/Enjoy natural scenery)

What Are Visitor Travel Patterns and Perceived Social Conditions?

Computer Simulation, Norms and Acceptability

Use of Computer Simulation Modeling at Yellowstone National Park

Part of the project involved building a computer model that simulates motorized winter travel in Yellowstone (Borrie et al 1998). This section of the report briefly describes the methods used for gathering inputs for the model, construction of the model, outputs of the model, and validity testing for the model.

Inputs to build the basic model were gathered by two procedures: exit questionnaires and entrance counts. In February 1997, 495 questionnaires completed by visitors at Park exits provided information about travel routes, group sizes, and vehicle types. Entrance counts on three separate days in February 1997 determined the number of visitors who entered at each entrance each hour from 7am to 6pm.

The model was built using the object-oriented simulation software package Extend. By using a combination of the input information described above and physical information about the layout of the roads, a model was built to simulate days of motorized winter use in the Park. Intensive internal verification of the algorithm and components of the model were confirmed using sensitivity analysis and other methods. Ten sets of random model runs were then conducted to generate outputs concerning three different indicator variables at three different total daily use levels. The indicator variables targeted were vehicles-per-viewscape (VPV), encounters, and counts. The three total daily use levels were 1200, 1600, and 3200. The average conditions in three different zones were targeted: whole road system, West Entrance to Old Faithful, and Hayden Valley Road. The results were also subdivided into three time periods during the day: 8am to 11am, 11am to 2pm, and 2pm to 5pm. In total, 150 model runs were conducted at an average of 1 hour 15 minutes per run.

The results of these runs are summarized in Tables 8, 9, and 10. Table 8 is a summary of the VPV results. The numbers indicate the number of minutes out of an hour that certain numbers of other vehicles will be within the viewscape of an average visitor. Viewscapes were defined as a 100 meter section of road. Looking at the top left cell in Table 8, it is shown that for total use level 1200 and the time period 8am to 11am, one can expect to see 0 other vehicles for 50 minutes out of an hour, 1 to 4 other vehicles for 7 minutes out of an hour, 5 to 10 vehicles for 2 minutes out of an hour, and more than 10 other vehicles for 1 minute out of an hour.

Table 8 VPV Estimates in Minutes Per Hour

		Time Period											
		8 to 11 am			11am to 2pm			2 to 5 pm			Whole Day		
		Total Use Levels			Total Use Levels			Total Use Levels			Total Use Levels		
	Others Seen	1200	1600	3200	1200	1600	3200	1200	1600	3200	1200	1600	3200
West to Old Faithful	0	50	48	37	41	36	18	51	48	41	47	44	32
	1 to 4	7	8	16	16	21	33	8	11	17	11	13	22
	5 to 10	2	3	5	2	3	6	1	1	2	2	2	4
	>10	1	1	2	1	1	3	0	0	1	0	1	2
Hayden Valley	0	59	59	57	57	56	50	57	57	53	58	57	54
	1 to 4	1	1	3	3	4	8	3	3	6	2	3	5
	5 to 10	0	0	0	0	0	1	0	0	1	0	0	1
	>10	0	0	0	0	0	0	0	0	0	0	0	0

Table 8. VPV Estimates in Minutes Per Hour (continued)

		Time Period											
		8 to 11 am			11am to 2pm			2 to 5 pm			Whole Day		
		Total Use Levels			Total Use Levels			Total Use Levels			Total Use Levels		
	Others Seen	1200	1600	3200	1200	1600	3200	1200	1600	3200	1200	1600	3200
Whole System	0	53	52	43	45	41	22	52	49	38	50	47	34
	1 to 4	6	6	12	13	17	31	8	10	19	9	11	21
	5 to 10	1	2	3	2	2	5	1	1	2	1	1	3
	>10	0	0	2	0	1	2	0	0	1	0	0	2

Table 9 is a summary of encounter results. Encounters are further subdivided into three types: overtaking encounters, overtaken encounters, and meeting encounters. An overtaking encounter is when a visitor encounters another vehicle by overtaking it. An overtaken encounter is when a visitor encounters another vehicle when he/she is overtaken by another vehicle. The incidence rate for these two types of encounters are roughly equal, since an overtaking encounter for one of the parties involved is an overtaken

encounter for the other party involved. Meeting encounters happen in three ways: one way is when a visitor encounters another vehicle head-on; the second way is if a visitor passes another vehicle that is stopped but still on the road; the last way is if a stopped visitor is passed by a moving vehicle. Table 9 presents these results both broken down by type and also as total numbers of all kinds of encounters.

Table 9. Encounter Estimates

		Time Period											
		8 to 11 am			11am to 2pm			2 to 5 pm			Whole Day		
		Total Use Levels			Total Use Levels			Total Use Levels			Total Use Levels		
	Type of Encounter	1200	1600	3200	1200	1600	3200	1200	1600	3200	1200	1600	3200
West to Old Faithful	Overtaking	2.8	3.8	7.7	1.8	2.4	4.6	1.2	1.8	3.0	2.0	2.6	5.3
	Meeting	2.7	4.2	7.4	7.1	9.6	20.6	4.5	6.0	13.0	5.3	7.1	14.7
	All	8.4	11.7	22.7	10.7	14.3	29.8	7.0	9.5	19.0	9.3	12.4	25.3
Hayden Valley	Overtaking	0.1	0.1	0.2	0.2	0.3	0.5	0.2	0.3	0.6	0.2	0.3	0.5
	Meeting	0.4	0.5	0.7	1.0	1.5	3.2	0.9	1.6	3.5	0.8	1.3	2.9
	All	0.5	0.7	1.0	1.3	2.1	4.2	1.3	2.2	4.6	1.1	1.9	3.9
Whole System	Overtaking	2.3	2.9	6.2	1.3	1.8	3.5	0.9	1.2	2.2	1.5	1.9	3.9
	Meeting	2.2	3.5	6.2	5.4	7.2	15.5	3.5	4.6	10.1	4.1	5.6	11.6
	All	6.8	9.3	18.6	8.0	10.8	22.5	5.2	7.1	14.4	7.1	9.4	19.5

For example, looking at the chart on the top left, it is shown that for total use level 1200 and the time period 8am to 11am, one can expect to overtake 2.8 other vehicles on average on the West to Old Faithful road segment. One can also expect to be overtaken by 2.8 other vehicles on average. Under the same conditions one can expect to meet 2.7 other vehicles in meeting encounters. Adding all of these different types of encounters together, a visitor can expect a total of 8.4 encounters per hour if he/she is traveling on the West to Old Faithful road segment.

Table 10 contains counts data, the last type of output generated. Counts indicate the number of vehicles that pass an average spot in the specified zone. This is similar to an average of real-life vehicle traffic counter counts done at many random locations within the zone. For example, if a visitor were to stand at one spot somewhere on the Hayden Valley Road between 8am and 11am when the total use level is 1200, he/she can expect to count an average of 5.6 vehicles passing by in an hour's time. These data were used primarily for model validation purposes.

Table 10. Summary of Modeled Count Information

	Time Period								
	8 to 11 am			11am to 2pm			2 to 5pm		
	Total Use Levels			Total Use Levels			Total Use Levels		
	1200	1600	3200	1200	1600	3200	1200	1600	3200
West to Old Faithful	100.1	119.7	272.3	154.4	215.9	432.7	58.3	79.4	148.9
Hayden Valley	5.6	7.7	15.5	16.1	28.9	54.8	9.1	15.7	34.6
Whole System	31.5	39.8	85.7	57.4	82.7	165.1	24.9	36.0	71.6

As with all data generated through simulation models, these results represent best estimates of real-life conditions. The model simplifies real conditions and has inevitable limitations. One particular difficulty concerns checking the model's validity to see if it sufficiently represents significant aspects of the real world. Ideally, field observations would be made in sufficient repetition under identical circumstances to act as a direct comparison with simulation data. Realistically, however, this approach is almost always unfeasible due to the enormous resources required. Indeed, if direct observations were practical then the simulation model would not have been needed. In the case of this Yellowstone model thousands of person hours would have been required to obtain adequate encounter and VPV data.

Instead of conducting direct field observations of encounter and VPV data, model validation efforts have concentrated on confirming that the model puts visitors in the right places at the right times. This has been conducted at a preliminary and anecdotal level. Field exit counts were taken by hour at Mammoth, South Entrance, and East Entrance for three days and compared to model output. Visual inspections through histograms and probability-probability plots show that the model outputs follow the general trends indicated by the exit counts. However, a high level of confidence cannot be placed in these validation tests. Quantitative

statistical comparisons between field and model data could not be conducted because exit count information from West Entrance (which accounts for 63% of all entrances) were not available. This lack of data makes quantitative validity testing speculative.

To increase confidence in the validation, further data collection was needed during the 1997 to 1998 season to increase confidence in the model. Four entrance/exit counts were conducted at all system entrances in the same manner as conducted in February 1997. In addition, counts inside the system were conducted in the same way as 1996 to 1997 season. The addition of these data enables the use of quantitative validity testing methods to improve confidence in the simulation model.

Validation, the checking of outputs against empirical data, consisted of comparing model outputs against empirical data from field counts. Three comparisons were made: 1) the distribution of visitor exits across exit points; 2) the distribution of visitor exits across time at each of the four entrance stations; and 3) the distribution of visitors who passed by an interior spot near Madison Junction through two hours during the day.

Chi-square tests with alphas at 0.05 produced mixed results. Tests yielded encouraging results for comparisons of exit frequencies through the day at South and East Entrances and also for comparisons of vehicle frequencies at a point south of Madison Junction. These chi-square tests provided no evidence that the model output was significantly different from the field count data. Chi-square tests for comparisons of exit frequencies through time at Mammoth and West Entrances and for comparisons of the distribution of exits across the exits yielded results that suggest model outputs may be significantly different from field counts. Graphic comparisons are shown in Figures 19, 20, and 21. These tests provide some confidence that the model output is a good general estimation of actual snow vehicle use. More field counts and vehicle route surveys may be conducted to increase the validity of the simulation model.

Figure 19. Frequency comparison between census data and model outputs of where visitors exited.

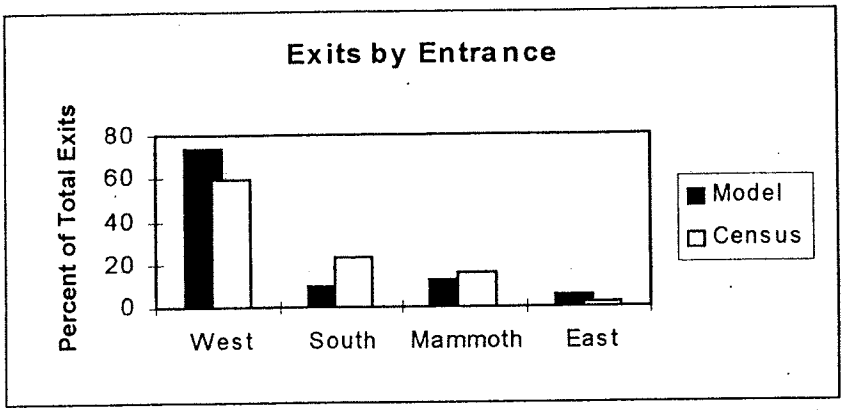


Figure 20. Frequency comparison between census data and model output of what time of day visitors exited from East Entrance.

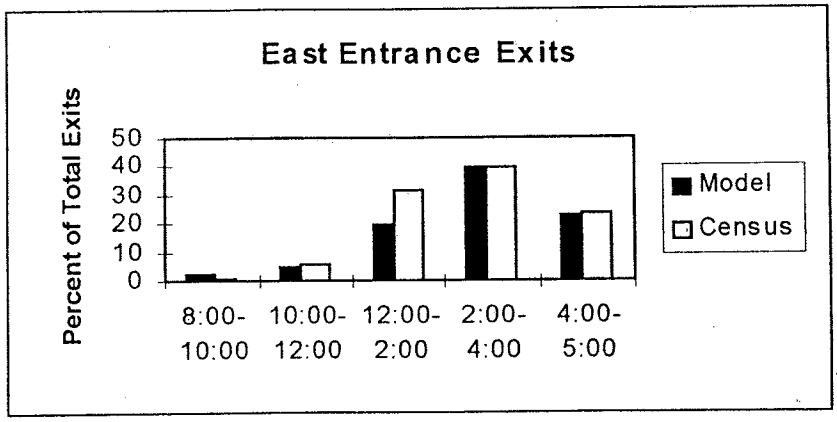


Figure 21. Frequency comparison between census data and model output of what time of day visitors exited from South Entrance.

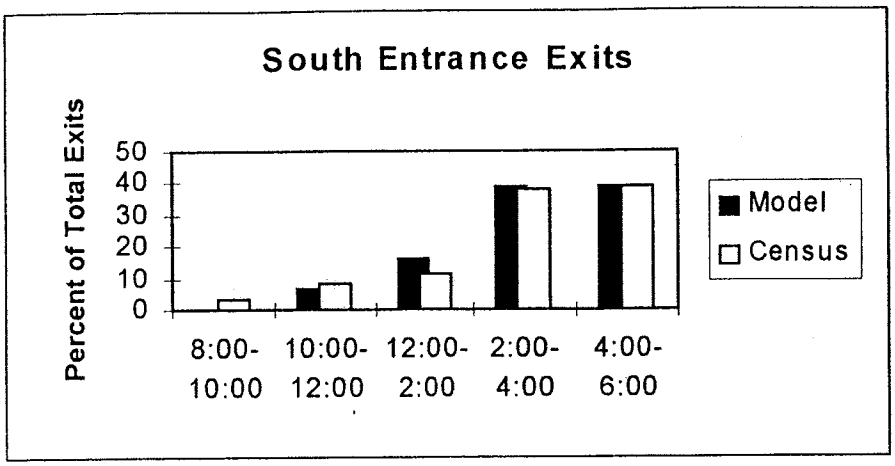


Figure 22. Frequency comparison between census data and model output of what time of day visitors exited from Mammoth.

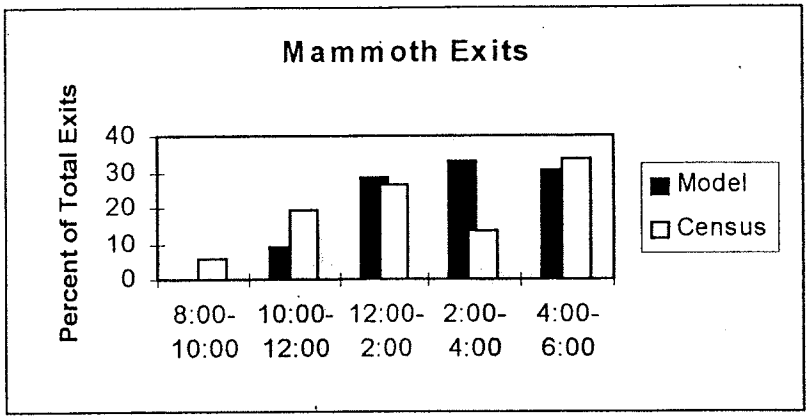


Figure 23. Frequency comparison between census data and model output of what time of day visitors exited from West Entrance.

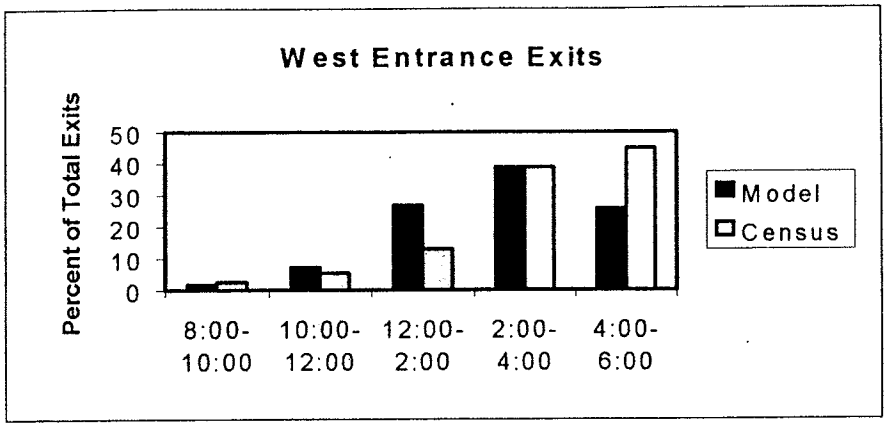
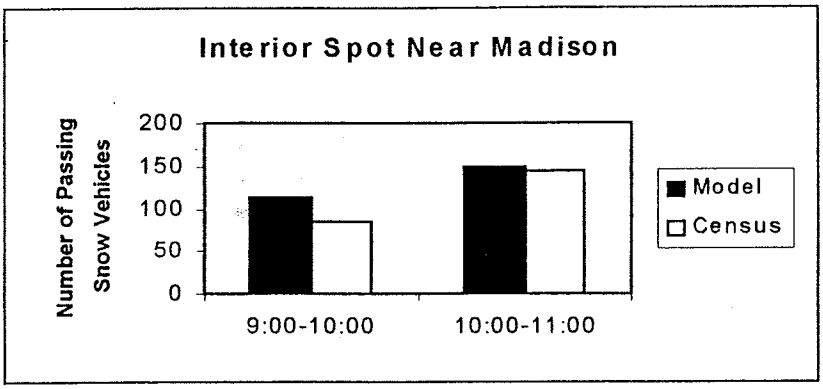


Figure 24. Frequency comparison between infrared counter data and model output of the distribution of the number of visitors who pass by an interior spot south of Madison Junction across the hours of the day.

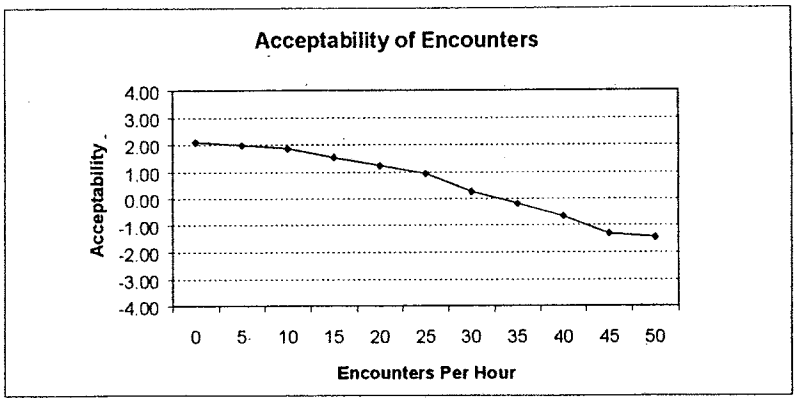


Encounter Norms by Snowmobile Users in Yellowstone National Park

Respondents were asked to respond to a series of questions regarding numbers of other people encountered during their winter experience at Yellowstone National Park. The questions asked them about acceptable numbers of encounters of other snow vehicles per hour. These questions were designed to represent several total daily use levels at various sites throughout the park at one of three time periods throughout the day. Acceptable numbers of encounters were measured by asking respondents to rate encounter conditions on a -4 (Very Unacceptable) to 4 (Very Acceptable) scale. We called this the Long Form method of measuring encounter norms. There were 11 conditions that respondents considered. The conditions were 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50 snowmobiles encountered per hour. Respondents were also asked to indicate the maximum acceptable number of meeting encounters and overtaking encounters per hour. We called this the Short Form method of measuring encounter norms. Responses to this series of questions are summarized in the following sections and are presented in total and divided by motivation cluster and expectation.

Acceptable Number of Snowmobile Encounters by Yellowstone Winter Visitors

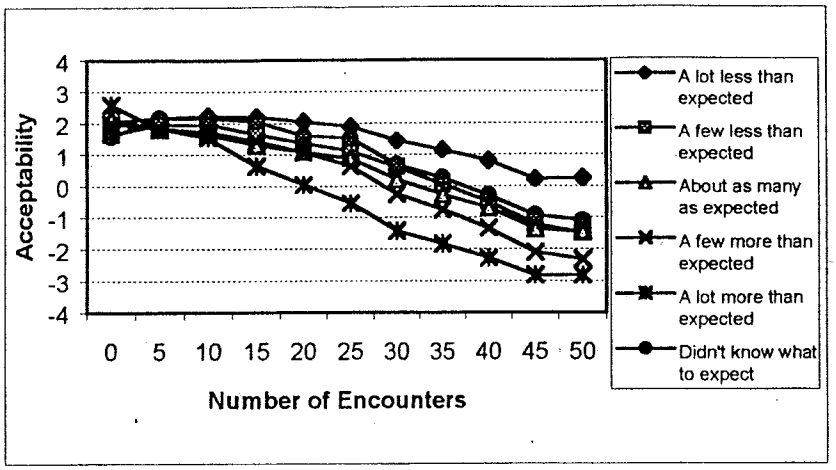
Figure 25. Acceptability of snowmobile encounters. Points on the graph represent the average acceptability rating for each condition



The point at which the number of encounters crosses from the acceptable range to the unacceptable range is approximately 33 other snowmobiles encountered per hour.

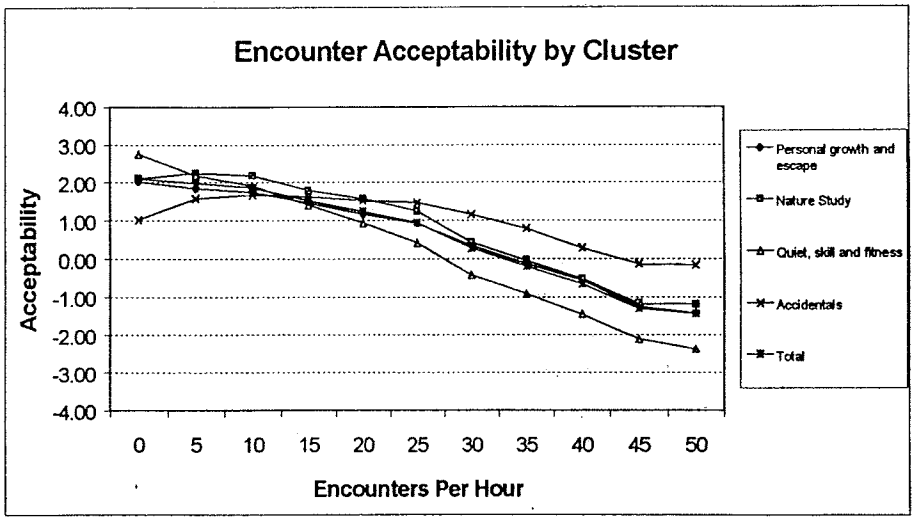
Visitors who saw a lot less other visitors than expected were more tolerant of greater number of encounters, while visitors who saw a few more or a lot more other visitors than expected were significantly less tolerant of greater numbers of encounters.

Figure 26. Acceptability of encounters by expectations for encounters. Points on the graph represent the average acceptability of each encounter condition within each expectation group



Quiet, Skill and Fitness Seekers were less tolerant of higher levels of encounters than other visitors, while Accidental Tourists were more tolerant of higher levels of encounters than other visitors.

Figure 27. Acceptability of encounters by motivation cluster. Points on the graph represent the average acceptability rating for each encounter condition within each motivation cluster.



Respondents were asked to differentiate between two types of encounters and to indicate how many of each of these types of encounters per hour would be acceptable. The first type of encounters were meeting encounters. Meeting encounters were defined as meeting another snowmobile that is traveling in the opposite direction. The second type of encounters, overtaking encounters were defined as passing or being passed by another snowmobile traveling in the same direction. Tables 11 and 12 show that, overall, respondents were willing to accept nearly 32 meeting encounters per hour and approximately 16 overtaking encounters per hour. This indicates that respondents are less tolerant of overtaking encounters than meeting encounters. This means that any

management actions that attempt to reduce encounters overall, should consider to not increase overtaking encounters to an unacceptable point (e.g. a one-way system).

Table 11 Meeting and Overtaking Encounters by Motivation Cluster.

Cluster	Meeting	Overtaking
Personal growth and escape (a)	31.10 d	16.97
Nature Study (b)	32.28 d	17.14
Quiet, skill and fitness (c)	23.90 d	10.85 d
Accidentals (d)	48.49 a,b,c	23.90 c
Total	31.56	16.41

* letters following the mean for each variable indicate statistically significant differences

Table 11 also shows that there are substantial differences in acceptability of meeting and overtaking encounters between the different motivation clusters. The accidentals were significantly more tolerant of meeting encounters than any other cluster, while they differed significantly from the quiet, skill and fitness cluster in the number of overtaking encounters they were willing to accept, while the personal growth and escape and nature study clusters did not differ significantly from any other clusters in the maximum number of acceptable overtaking encounters.

Table 12. Meeting and Overtaking Encounters by Expectation

Expectation	Meeting encounters	Overtaking encounters
Saw a lot less than expected (a)	42.3 c,d,e	23.7 d,e
Saw a few less than expected (b)	32.8 e	15.5
Saw about as many as expected (c)	30.7 a,e	16.4
Saw a few more than expected (d)	26.3 a	12.9 a
Saw a lot more than expected (e)	18.4 a,b,c	9.4 a,f
I really didn't know what to expect (f)	31.8	21.8 e
Total	31.6	16.4

* letters following the mean for each variable indicate statistically significant differences

Table 12 shows the difference in the maximum acceptable meeting and overtaking encounters by expectation. In general, respondents who saw more snow vehicles than expected were less tolerant of both meeting and overtaking encounters. Respondents who did not know what to expect were significantly more tolerant of overtaking encounters that respondents who saw a lot more snow vehicles than expected.

How Well Do Answers to Both Types of Encounters Questions Coincide?

It is somewhat difficult to compare the long form and short form of the encounters questions. While the point where the norm curve crosses from acceptable to unacceptable (the scale value of 0" on the acceptability scale) seems to be a logical point to compare with the short form, the differences in the way the questions were asked may have led respondents to slightly different interpretations of encounters. For example, in the long form, we asked respondents to rate the acceptability of different levels of encounters, but we did not expand the explanation to include descriptions of meeting and overtaking encounters as we did in the short form of the question. This difference in wording may not have elicited the thought of an overtaking encounter. Therefore, on the long form, respondents may only have been rating the acceptability of meeting encounters. When we compare these two figures (33 in the long form and about 32 meeting encounters in the short form shown in Tables 11 and 12) the numbers correspond almost exactly.

Acceptable Number of Snow Vehicles in Sight by Yellowstone Winter Visitors

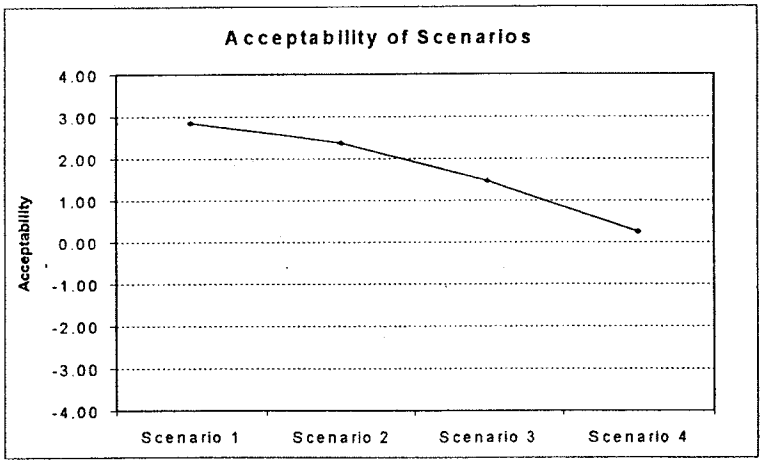
Respondents were also asked to respond to a series of questions about the number of other snow vehicles per viewscape it would be acceptable to see at any time during their visit. These questions were also designed to represent several total daily use levels at various sites throughout the park at one of three time periods throughout the day and were based on output from the computer simulation model (see Table 13 for examples and Appendix C for photos used). Respondents were presented with a series of four scenarios. The scenarios were linked to 4 photographs that were computer manipulated to represent different snowmobile use conditions. Each scenario indicated how many minutes out of each hour a visitor would see the number of snowmobiles in each picture. Respondents were asked to rate the acceptability of each scenario.

As with the encounters variable, respondents were also asked to complete a short form of the scenarios questions. Respondents were asked which scenario represented the highest level of winter snowmobile use that the National Park Service should allow in Yellowstone National Park. They were also given the opportunity to respond that none of the scenarios represent that condition, or that use should not be limited.

Table 13 Four Study Scenarios

	Section of Park	Time Period	Daily Use Level
Scenario 1: No vehicles in view for 56 minutes per hour 4 vehicles in view for 4 minutes per hour 8 vehicles in view for 0 minutes per hour 12 vehicles in view for 0 minutes per hour	West to Old Faithful	2pm to 5pm	1200
Scenario 2: No vehicles in view for 47 minutes per hour 4 vehicles in view for 11 minutes per hour 8 vehicles in view for 2 minutes per hour 12 vehicles in view for 0 minutes per hour	West to Old Faithful	2pm to 5pm	1600
Scenario 3: No vehicles in view for 36 minutes per hour 4 vehicles in view for 20 minutes per hour 8 vehicles in view for 3 minutes per hour 12 vehicles in view for 1 minutes per hour	West to Old Faithful	11am to 2pm	1600
Scenario 4: No vehicles in view for 18 minutes per hour 4 vehicles in view for 33 minutes per hour 8 vehicles in view for 6 minutes per hour 12 vehicles in view for 3 minutes per hour	West to Old Faithful	11am to 2pm	3200

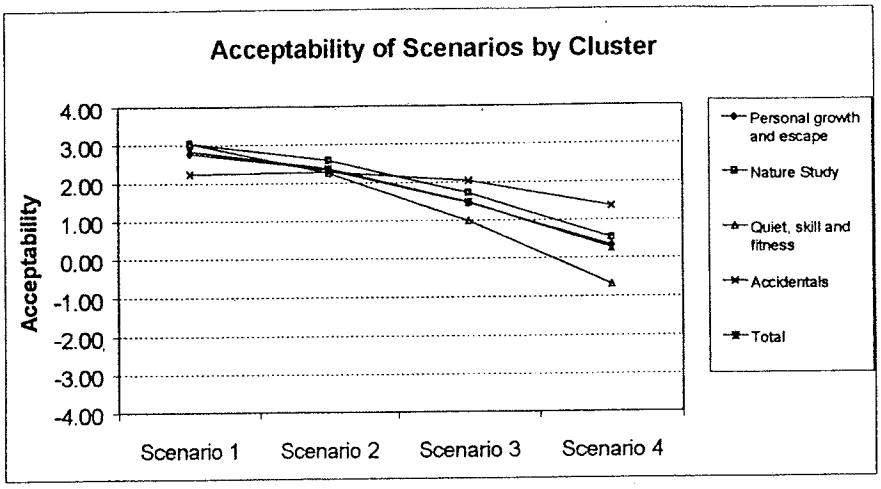
Figure 28. Acceptability of Scenarios. Points on the graph represent the average acceptability rating for each scenario.



While there is a general downward trend in the acceptability of each scenario, on average none of the scenarios were unacceptable. The fourth scenario, which doubled the current average use level at the busiest time of day on the busiest sections of trail, approached the neutral point.

The Accidentals found the first scenario significantly less acceptable than the Nature Study cluster. The Quiet, skill and fitness cluster found the third scenario significantly less acceptable than the Nature Study or Accidental clusters. The Quiet, skill and fitness cluster found the fourth scenario significantly less acceptable than all the other clusters while the Accidentals found the fourth scenario significantly more acceptable than Personal growth and Quiet, skill and fitness clusters.

Figure 29. Acceptability of scenarios by motivation cluster. Points on the graph represent the average acceptability rating for each scenario within each cluster.



In general, the respondents who saw a lot more other visitors than they expected rated scenarios 3 and 4 as less acceptable than every other group, while respondents who saw a lot fewer visitors than they expected rated scenarios 3 and 4 significantly more acceptable than respondents who saw more or about the same number of other visitors they expected to see.

Figure 30. Acceptability of scenarios by expectation. Points on the graph represent the average acceptability rating for each scenario within each expectation group.

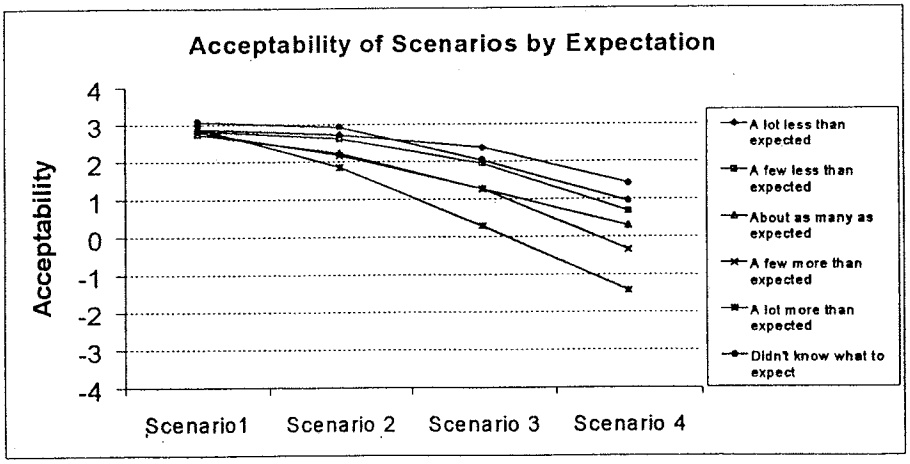


Table 14. Scenario that represents the highest level of use NPS should allow		
Scenario	Number	Percent
Scenario 1	61	8.8
Scenario 2	82	11.8
Scenario 3	132	19.1
Scenario 4	68	9.8
The number of snowmobiles should not be limited at any point represented by the scenarios	190	27.5
The number of snowmobiles should not be limited at all	159	23.0

How Well Do Answers to Both Types of Scenarios Questions Coincide?

Like the answers to encounter questions, the long and short form of the scenarios questions are relatively congruent in the information they provide. Just over half of the respondents (50.5%) indicated that none of the scenarios showed a level of snowmobile use that they thought should be limited by the National Park Service in the short form, while nearly half of the respondents (48.2%) found scenario 4 acceptable in the long form of the question. An additional 7.8% of respondents found Scenario 4 to be at the margin of acceptability in the long form while 9.8% thought the National Park Service should limit use at that level. While this congruence is striking, two different evaluative dimensions of snowmobile crowding were used in the two questions. The long form used acceptability while the short form used the point at which managerial actions should be taken. Past research has shown that these two dimensions can vary significantly. Therefore, the congruence tends to deteriorate in the scenarios that depict lower levels of use. It may be that while some visitors rate lower use levels as relatively unacceptable, they are not willing to limit use at those lower levels.

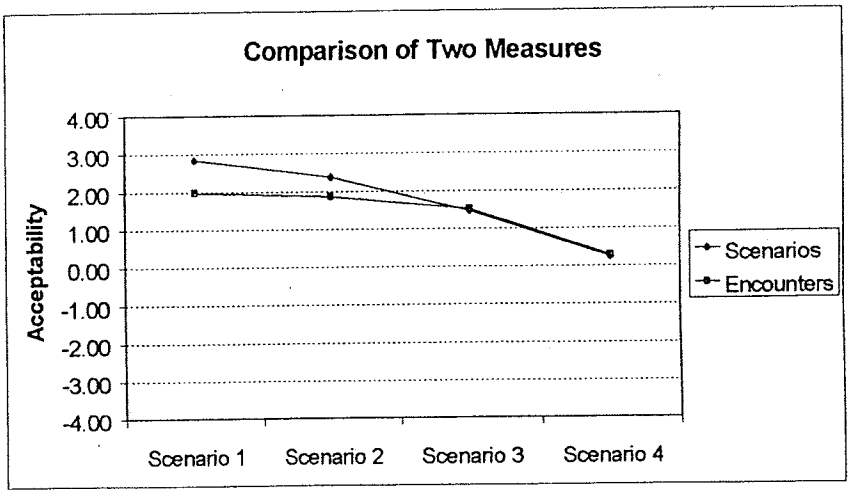
How Well Do Encounters and the Scenarios Coincide?

Using the simulation model, it is possible to compare the two measures of use--encounters and scenarios--under the same theoretical conditions. Therefore it is possible to plot average acceptability ratings for encounters and the scenarios on the same graph to see how well the two different measures coincide. As Figure 31 shows,

the two measures produce similar results. We plotted the average acceptability rating for encounters based on the conditions set up in the scenarios and the average acceptability ratings for the scenarios. The conditions in Scenario 1 produced less than 1 encounter per hour, while the conditions in Scenario 2 produced approximately 10 encounters per hour. The conditions in Scenario 3 produced approximately 15 encounters per hour and the conditions in Scenario 4 produced approximately 30 encounters per hour. We compared the two measures at each set of conditions using paired t-tests. The average ratings for the first two scenarios differed significantly from the average ratings for encounters under the same set of conditions ($p<.01$). The average acceptability ratings for the third and fourth scenarios did not differ significantly from average acceptability ratings for encounters under the same conditions ($p>0.2$).

Acceptability ratings for the first two scenarios differed significantly from acceptability ratings for encounters under the same conditions. Acceptability ratings for the last two scenarios were virtually identical to acceptability ratings for encounters under the same conditions.

Figure 31. Comparison of Acceptability of Encounters and Scenarios.



What Would Visitors Do If Portions of the Park Were Closed to Snow Vehicles?

To find out what visitors would have done if a section of the park were closed to snow vehicles, we asked respondents to indicate what they would have done if the Hayden Valley section of the park were closed to snow vehicles. Table 15 shows the responses of only those visitors who traveled through Hayden Valley during their visit. Over a quarter of the respondents (28.6%) indicated that they would take different routes to see the same destinations while 16.9% indicated that they would take a different route through the park but visit different destinations. An additional 15.7% indicated that they would not change their route through the park. It is unclear whether these respondents misunderstood the question, or would be willing to overlook park rules if road closures were implemented. Over one-fifth of the respondents (21.9%) indicated that they would spend less time in Yellowstone National Park while 11.1% indicated that they would decide not to visit Yellowstone National Park in the winter.

With nearly half of the respondents who traveled through Hayden Valley indicating that they would choose a route to visit the same destinations they visited during their visit (46.1%), it is clear that visitors have a set of destinations that they wish to visit during their travel in Yellowstone National Park. It is important to these visitors that they are able to get to these destinations within the park. We asked visitors to indicate the three most rewarding places/highlights they intended to see in YNP. These responses are in Table 16. Respondents were allowed multiple responses to this question.

Table 15. Alternative routes if Hayden Valley were closed to snow vehicles

	Frequency	Percent
Taken same route to see same destinations	54	15.7
Taken different route to see same destinations	98	28.6
Taken different route, but see different destinations	58	16.9
Chosen different entrance to see same destinations	6	1.8
Chosen different entrance, but see different destinations	4	1.2
Spent less time in Yellowstone National Park	75	21.9
Visited surrounding National Forests/Parks instead of Yellowstone National Park	10	2.9
Decided not to visit Yellowstone National Park in winter	38	11.1
N=	343	

While nearly half of the respondents who traveled through Hayden Valley indicated that they would prefer to go to the same destinations if the valley was closed, specific destinations in Yellowstone National Park were not as popular as more general features found throughout the park. For example, 286 respondents indicated that Old Faithful was a highlight, while 564 identified wildlife as a highlight. So, while visitors have specific routes that they prefer to follow through Yellowstone National Park, with specific features and destinations they wish to see, the experience of seeing the more general features of the park is perhaps more important than the specific attraction sites in the park.

Table 16. Most rewarding places and highlights

Places and Highlights	Number	Percent
Wildlife	564	24.0
Other/Miscellaneous	495	21.1
Other Geothermal Features	379	16.2
Old Faithful	286	12.2
Grand Canyon	248	10.6
Waterfalls	165	7.0
Scenery/Vistas	112	4.8
Yellowstone Lake	84	3.6
Other Canyons	14	0.6
N=	2347	

How Do Visitors Respond to Management Initiatives?

Management Action Support of Respondents

An aspect of management equally important as identifying and characterizing YNP's visitors is examining visitor support for management actions. Gaining insight into support for potential management actions is invaluable to managers who must make decisions that would greatly affect visitor experience in the park. It is important to not only understand what management actions visitors favor, but because there is no "average visitor" it is imperative to understand what types of visitors favor those actions. Likewise, management actions that have little

support from visitors in general or specific visitor types may prove to cause future conflict if implemented.

Measurement of Management Support

Respondents were asked to express their support of or agreement with various management actions under two different formats. First, respondents were to rate their support from one, "strongly oppose" to five, "strongly support" on a series of management actions given the conditions of the Park on their visit. The management actions were generated from information supplied by NPS staff, planning, and policy documents. Table 17 illustrates the most and least supported management actions on average. The means range from "oppose" (2) to "support" (4). The requirement of noise and emissions standards on all snowmachines gained on average the most support (4.02) with some variability. The least supported management actions are related to changing the current status of the groomed roads. Respondents on average oppose closing roads to oversnow vehicles or restricting the roads to snowcoach use as do they oppose plowing the road from W. Yellowstone to Old Faithful.

Table 17. Support for management actions.

Management Actions	N	Mean	Med.	Std. Dev.
Require all snowmachines to meet strict, but reasonable Emissions/noise standards	1051	4.02	4	1.08
Provide more info-appropriate behavior	1050	3.96	4	.93
Provide more info-snow/trail conditions	1052	3.80	4	.83
Provide more info-identifying points of interest along trails	1050	3.79	4	.93
Maintain and groom snowmobile trails more often	1049	3.74	4	1.17
Provide more info-things to see and do outside of YNP	1054	3.71	4	.95
Be more aggressive enforcing-snowmobile speed limits	1053	3.66	4	1.10
Be more aggressive enforcing-safety rules and regs	1049	3.62	4	.98
Provide more info-things to do in YNP	1046	3.59	4	.95
Continue and increase advertisement of other rec. areas	1047	3.56	4	.96
Provide more trails/locations for recreation use	1047	3.51	4	1.21
Provide more park rangers	1053	3.39	3	.89
Increase facilities provided to disperse use	1046	3.39	3	1.05
Provide guided snowmobile trips by NPS staff	1051	3.02	3	1.10
Establish alternate use periods	1036	3.01	3	1.08
Provide more winter accommodations	1049	2.90	3	1.20
Close roads to oversnow vehicles	1039	2.16	2	1.27
Restrict groomed roads to snowcoach travel only	1048	2.10	2	1.31
Plow road from W Yellowstone to OF	1046	2.02	2	1.27

1=strongly oppose, 2=oppose, 3=neither support or oppose, 4=support, 5=strongly support

Respondents were then asked to rate the extent they agreed or disagreed with requiring visitors to follow a list of eight management initiatives in order to better

protect the bison herd in the Park. The management initiatives range from the less intrusive, like limiting the size of groups and watching a compulsory video to more intrusive actions like a permit system or shortening the winter season. The scale provided ranged from one, "strongly disagree" to five, "strongly agree". In general respondents did not agree with any of the requirements proposed to protect the bison herd. Table 18 shows that the means ranged from "neither agree or disagree" (3) to "strongly disagree" (1). Of those items implementing a permit system and restricting the days of the week visitors could travel in the Park garnered the least agreement. On average, visitors neither agreed or disagreed with limiting the size of visitor groups. This initiative had the highest mean.

Table 18. Support for management initiatives in order to protect the bison herd.

Management Initiatives	N	Mean	Med.	Std. Dev.
Limit size of groups	1043	3.01	3	1.25
Travel only in specific areas	1040	2.88	3	1.32
Watch 30 minute video	1046	2.55	2	1.21
Wait up to one hour before travel	1005	1.99	2	.91
Travel only at particular time of day	1032	2.10	2	1.06
Travel only on particular days of the week	1037	1.98	2	1.02
Travel only in shortened season	1031	2.12	2	1.12
Obtain a required permit	1039	1.95	2	1.10

1=strongly disagree, 2=disagree, 3=neither agree or disagree, 4=agree, 5=strongly agree.

Analyzing Differences in Management Action Support between Respondent Types

Throughout the report motivation and satisfaction have been analyzed in terms of respondent entrance site, mode of transportation, and most rigorously, motive clusters. The same strategy will be implemented here in the analysis of management support.

Table 19. Respondent support for management actions by entrance.

Management Action	North			West			South			East			Chi-Square	
	Mean	Med.	S.D.	Mean	Med.	S.D.	Mean	Med.	S.D.	Mean	Med.	S.D.	$\chi 2$	p-value
Require all snowmachines to meet strict, but reasonable emissions/noise standards	4.49	5.00	.78	3.98	4.00	1.08	3.89	4.00	1.11	3.36	3.00	1.14	59.589	<.001
Provide more info-appropriate behavior	4.24	4.00	.89	3.97	4.00	.91	3.76	4.00	.94	3.74	4.00	.88	34.702	.001
Be more aggressive enforcing-snowmobile speed limits	4.23	5.00	1.03	3.64	4.00	1.07	3.37	3.00	1.06	3.15	3.00	1.06	99.734	<.001
Be more aggressive enforcing-safety rules and regs.	3.73	4.00	.96	3.65	4.00	.99	3.48	3.00	.96	3.31	3.00	.95	15.501	.215
Provide more info-snow/trail conditions	3.54	4.00	.80	3.89	4.00	.83	3.70	4.00	.82	3.90	4.00	.79	36.590	<.001
Continue and increase advertisement of other rec. areas	3.53	4.00	1.06	3.59	4.00	.94	3.52	4.00	.93	3.56	4.00	.85	16.032	.190
Provide more park rangers	3.36	3.00	.92	3.47	3.00	.87	3.25	3.00	.89	3.18	3.00	.85	15.758	.203
Provide more info-identifying points of interest along trails	3.30	3.00	1.00	3.90	4.00	.88	3.83	4.00	.89	3.92	4.00	.90	66.328	<.001
Provide more info-things to see and do outside of YNP	3.30	3.00	.95	3.89	4.00	.92	3.51	4.00	.93	3.69	4.00	.86	83..06	<.001
Establish alternate use periods	3.22	3.00	.99	2.99	3.00	1.08	2.91	3.00	1.13	2.79	3.00	1.10	24.124	.020
Provide more info-things to do	3.08	3.00	1.03	3.72	4.00	.89	3.62	4.00	.93	3.69	4.00	.77	68.531	<.001
Restrict groomed roads to snowcoach travel only	3.08	3.00	1.42	1.87	1.00	1.17	2.04	2.00	1.28	1.61	1.00	1.05	128.678	<.001
Close roads to oversnow vehicles	3.05	3.00	1.42	1.97	2.00	1.15	2.08	2.00	1.25	1.79	1.00	1.06	117.740	<.001
Provide more trails/locations for recreation use	2.93	3.00	1.29	3.65	4.00	1.17	3.58	4.00	1.16	3.62	4.00	1.14	55.888	<.001
Increase facilities provided to disperse use	2.91	3.00	1.16	3.51	4.00	.99	3.40	4.00	1.03	3.44	4.00	1.14	57.483	<.001
Maintain and groom snowmobile trails more often	2.67	3.00	1.27	4.02	4.00	1.05	3.75	4.00	.96	3.82	4.00	.91	218.831	<.001
Provide guided snowmobile trips by NPS staff	2.59	3.00	1.21	3.16	3.00	1.04	2.94	3.00	1.08	2.95	3.00	1.12	53.580	<.001
Provide more winter accommodations	2.52	2.00	1.18	2.94	3.00	1.19	2.96	3.00	1.21	3.51	3.00	1.02	35.359	<.001
Plow road from W Yellowstone to OF	2.21	2.00	1.41	1.93	1.00	1.24	2.14	2.00	1.25	1.82	1.00	1.10	24.364	.018

1=strongly oppose, 2=oppose, 3=neither support or oppose, 4=support, 5=strongly support.

Table 20 depicts the means, medians, standard deviations and ranks of the management actions ratings according to motive clusters. The items are in descending order with respect to the means of the Personal Growth segment. The table also provides a Chi Square test of significance which will be interpreted at an alpha level of .05. The medians overall range from one, "strongly oppose" to four, "support". The segments are similar in that on average the management action requiring snowmachines to meet emissions and noise standards gained the most support of any of the items. Likewise, the four clusters each rated on average, closing roads to oversnow vehicles, restricting roads to snowcoach use, and plowing the road from W. Yellowstone to Old Faithful as the least supported actions. Most of the significant differences between clusters can be explained by Accidentals Cluster. As a whole, the Accidentals are relatively less supportive of most of the management actions than any other cluster. They supported maintaining and grooming snowmobile trails more often and providing more trails or locations for recreation significantly more than any other group. The Nature Study and Quiet Fitness clusters were significantly more supportive of aggressive enforcement of snowmobile speed limits than the other groups. The Personal Growth cluster were more supportive of providing more trails for recreation use, more facilities to disperse use, and more park rangers. All groups were highly supportive of requiring all snow machines to meet strict but reasonable emissions/noise standards.

Table 21 portrays an overwhelming lack of support for any of the management actions provided in order to better protect the bison herd. The medians here range from one "strongly disagree" to three "neither agree or disagree". Again, distinct differences and similarities exist across motive clusters. No differences are detected in the three management actions that claimed the highest amount of disagreement in each segment. The Accidentals are significantly different in their agreement with limiting the size of groups, although each cluster rated this management option in the top two on average.

Table 20. Respondent extent of support for management actions given the conditions at YNP.

Management Action	Personal growth				Nature Study				Quiet Fitness				Accidentals				Chi -Square	
	Mean	Med.	S.D.	*R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	χ^2	p-value
Require all snowmachines to meet strict, but reasonable emissions/noise standards	4.11	4.00	1.02	1	4.01	4.00	1.13	1	4.23	4.00	.92	1	3.34	3.00	1.16	9	53.698	>.001
Provide more info-appropriate behavior	4.05	4.00	.88	2	3.97	4.00	.94	2	3.91	4.00	.97	2	3.62	4.00	.92	7	20.580	.057
Provide more info-identifying points of interest along trails	3.91	4.00	.89	3	3.82	4.00	.90	3	3.69	4.00	1.05	4	3.69	4.00	.89	4	21.340	.046
Provide more info-snow/trail conditions	3.86	4.00	.82	4	3.75	4.00	.84	7	3.77	4.00	.88	6	3.76	4.00	.83	5	9.475	.662
Provide more info-things to see and do outside of YNP	3.86	4.00	.89	5	3.59	4.00	1.03	4	3.59	4.00	1.01	3	3.67	4.00	.94	2	20.221	.063
Maintain and groom snowmobile trails more often	3.83	4.00	1.14	6	3.69	4.00	1.12	6	3.56	4.00	1.32	8	4.01	4.00	.96	1	29.267	.004
Provide more trails/locations for recreation use	3.72	4.00	1.14	7	3.28	3.00	1.28	12	3.31	4.00	1.30	11	3.72	4.00	1.16	3	44.221	>.001
Provide more info-things to do	3.71	4.00	.95	8	3.51	3.00	.99	9	3.51	4.00	.96	10	3.64	4.00	.79	6	22.260	.035
Continue and increase advertisement of other recreation areas	3.71	4.00	.95	9	3.49	3.00	.98	10	3.55	4.00	1.00	9	3.26	3.00	.87	11	29.737	.003
Be more aggressive enforcing-safety rules and regs.	3.70	4.00	1.00	10	3.58	4.00	.94	8	3.58	3.50	.94	7	3.30	3.00	.92	10	18.569	.099
Be more aggressive enforcing-snowmobile speed limits	3.69	4.00	1.08	11	3.71	4.00	1.05	5	3.68	4.00	1.11	5	3.22	3.00	1.08	12	23.197	.026
Increase facilities provided to disperse use	3.59	4.00	1.02	12	3.25	3.00	1.11	13	3.14	3.00	1.19	14	3.36	3.00	.89	8	50.368	>.001
Provide more park rangers	3.53	3.00	.81	13	3.49	3.00	.90	11	3.26	3.00	.91	12	3.07	3.00	.81	13	41.116	>.001
Provide guided snowmobile trips by NPS staff	3.14	3.00	1.08	14	3.07	3.00	1.11	14	2.76	3.00	1.13	16	2.91	3.00	1.04	15	22.482	.032
Establish alternate use periods	3.09	3.00	1.06	15	2.87	3.00	1.13	15	3.15	3.00	1.05	13	2.67	3.00	1.09	16	20.841	.053
Provide more winter accommodations	3.01	3.00	1.23	16	2.78	3.00	1.15	16	2.80	3.00	1.26	15	3.03	3.00	1.11	14	18.581	.099
Close roads to oversnow vehicles	2.15	2.00	1.30	17	2.01	2.00	1.12	17	2.38	2.00	1.40	17	1.95	1.50	1.16	18	17.822	.121
Plow road from W Yellowstone to OF	2.10	2.00	1.33	18	1.75	1.00	1.14	19	1.96	1.00	1.29	19	1.99	2.00	1.10	17	23.608	.023
Restrict groomed roads to snowcoach travel only	2.09	2.00	1.32	19	2.00	2.00	1.28	18	2.20	2.00	1.41	18	1.65	1.00	.88	19	23.807	.022

*Rank; 1=strongly oppose, 2=oppose, 3=neither support or oppose, 4=support, 5=strongly support

Table 21. Extent of agreement with management action in order to better protect the bison herd.

Management Action	Personal growth				Nature Study				Quiet fitness				Accidentals				Chi-Square	
	Mean	Med.	S.D.	*R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	Mean	Med.	S.D.	R.	χ^2	p-value
Limit size of groups	3.10	3.00	1.21	1	2.96	3.00	1.30	1	3.22	3.00	1.29	1	2.43	2.00	1.06	2	36.712	>.001
Travel only in specific areas	2.90	3.00	1.32	2	2.90	3.00	1.35	2	3.08	3.00	1.31	2	2.57	3.00	1.19	1	26.669	.009
Watch 30 minute video	2.76	3.00	1.21	3	2.47	2.00	1.29	3	2.50	2.00	1.22	3	2.09	2.00	1.00	3	44.554	>.001
Travel only at particular time of day	2.20	2.00	1.07	4	2.14	2.00	1.15	4	2.13	2.00	1.08	5	1.77	2.00	.77	5	21.288	.046
Travel only in shortened season	2.19	2.00	1.15	5	2.01	2.00	1.10	5	2.18	2.00	1.18	4	1.85	2.00	.95	4	13.674	.322
Wait up to one hour before travel	2.09	2.00	.94	6	1.92	2.00	.94	6	1.98	2.00	.92	8	1.77	2.00	.79	6	15.898	.196
Travel only on particular days of the week	2.01	2.00	1.02	7	1.89	2.00	1.00	7	2.08	2.00	1.14	6	1.73	2.00	.80	7	18.479	.102
Obtain a required permit	1.99	2.00	1.11	8	1.83	1.00	1.08	8	2.03	2.00	1.12	7	1.64	1.00	.90	8	14.559	.266

*Rank; 1=strongly disagree, 2=disagree, 3=neither agree or disagree, 4=agree, 5=strongly agree

What Are the Major Themes and Research Recommendations?

Themes Within the Results

There Is a Wide Diversity Among Winter Visitors

At first glance, it would be easy to assume that Yellowstone winter visitor's are fairly homogenous. Snowmobilers use the same mode of transportation, tend to look alike, and follow fairly similar and predictable travel patterns. The same may be said about people who come to ski or snowcoach. However, there is little obvious reason for segmenting visitors by activity as compared to other use and user charactereristics such as length of stay, group size, type of group, or motivation to visit. The data from this study, however, demonstrate that within each activity type, visitors seek distinctly different experiences and should not be assumed to be seeking and enjoying a uniform type of experience dictated by activity type. Traditional recreation management principals suggest that managing for experience opportunities is generally preferred over managing for activities.

Recognizing that visitors are seeking differing goals has at least three implications for management. First, it would be easy for managers to assume that the visitors are homogenous. This could inaccurately lead to the assumption that visitors would respond to or support management actions uniformly. For example, in comparing accidental tourists with the nature study folks (two of the clusters of visitor motivations) we see distinct differences in their support of management actions. The accidental tourist, for example, may not appear satisfied with any action but also may not have that great of an investment with the outcome of the management action. Where a person seeking nature study

may have a greater stake in the management action and would be willing to sacrifice slightly more of their experience to the perceived good of the natural resources.

Second, it would be easy to assume that snowmobilers are uniformly different from visitors who do not snowmobile. While visitors who snowmobile are more likely to be interested in personal growth or to be there "accidentally", visitors engaged in each type of activity are distributed across all four of the motivation clusters identified in this data. Similar dynamics occurs when looking at the distribution of visitor types that access the park from each entrance. That is, at each entrance we see a range of visitors in each motivation cluster, some seeking nature study, some peace and quiet, some fitness, etc.

Third, many of the visitors do more than one activity while in the park. Taken together, the use of experience motives is a more valid way to address the visitor segments than to consider the groups skiers, snow coach riders, snowmobilers or pleasure drivers. It also does not seem that the entrance a visitor uses is closely related to the goals for a visit or assessment of management conditions.

Tying together the above-mentioned implications, it can be seen that managers are working with a visitor population that will be difficult at times to understand. While they look and travel in similar patterns, they differ in their reason for visiting and assessing the park. Since goal interference is considered a primary influence on conflict among recreationists, it appears as likely for conflict to be occurring within visitor types as among them. Indeed, the slightly lower satisfaction levels of the accidental tourists may be associated with such conflicts (it is difficult to estimate the motivation this group would have to approach a manager with a complaint, since they are not as engaged within the park as the other visitors). Management strategies that increase the opportunities for nature study, personal growth and quiet fitness, are likely to be supported by a broad subset of the visitors.

The Yellowstone Experience Is Satisfactory!

The winter visitor experience to Yellowstone National Park is a treasured one. From many visitors we have heard stories of extraordinary events, magical moments, and unforgettable images of one of the nation's greatest parks. Yellowstone in winter is a powerful experience and visitors feel fortunate in being able to see its treasures. There are those who view the winter as a resting period for the park and its denizens, a chance to recover from the pressures of summer visitation. However, the winter visitors not only treasure the same peace and quiet, they are seeking out many of the same experiences that Yellowstone provides during the spring, summer and fall.

It is a park known for its wildlife – wolves, bison, and elk. It is a symbol of the nation, and features such as Old Faithful are powerful attractants at any time of the year. Visitors enjoy the opportunity to recreate, escape the usual routine of their daily lives, and to share their experiences with family and friends. Visitors are prepared to accept moderate levels of organization and regulation given the uniqueness and importance of the experience. Being kept to the roads, and the traffic congestion that sometimes this entails in both winter and summer is tolerable. Overall, satisfaction with the winter experience is very high.

The winter visitors to Yellowstone generally perceive the current management strategies to be fair and appropriate. There is not necessarily perceived to be a problem requiring drastic action. The winter visitors are supportive of management actions that would facilitate or improve the experiences they are currently afforded, such as requiring stricter emission standards for snowmobiles, greater enforcement of current safety rules and regulations, and the provision of more information about the park and its features. Management actions that are

not supplemental to current conditions and that might disrupt or substantially alter the balance of experiential opportunities receive uneven support, or common levels of opposition. (One example that receives strong disapproval is the plowing of the road to Old Faithful).

It is not uncommon for visitors to recreation sites to be generally supportive of the status quo or to encourage slight improvements. YNP's winter visitors' tolerance level of current conditions (or even greater levels of crowding) however, seems notable as does the opposition to a variety of management options that would constrain or curtail some of the current visitor activities.

For example, the lack of support for a variety of trade-offs that visitors might be asked to make in order to better protect the park's bison herd is surprising, particularly given the importance they express for wildlife values. Even moderate requests, such as watching a compulsory 30 minute video receive active levels of opposition. We suggest that winter visitors perceive either that there is no problem with visitor interactions with the bison, or that suggested management actions would not have the desired effect on the bison herd, or that the actions suggested are inappropriate for protecting the bison. While the visitor may have heard about the problem, there is little impetus for change generated by their own experiences within the park. Things seem and feel OK, and perhaps their generally high levels of satisfaction with this special and unique opportunity flavors their perceptions of the park and its management.

There Is Time for Good Planning

While winter use issues within Yellowstone National Park are embroiled with tension and controversy, the majority of the visitor experiences within the park are fairly intact. In the absence of another surge of demand or a dramatic alteration of the experience by a management action, it is likely that satisfaction levels will remain high. Although there is a possibility that some people have

been displaced and are therefore unaccounted for within this sample, the visiting population of winter users in Yellowstone National Park are highly satisfied. These data suggest that managers have a window of opportunity here in which planning efforts can be conducted and the implementation of such plans gradually applied. The urgency to address issues associated with winter use in YNP is not originating from the majority sentiment of the winter visitors.

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Appendix A

Name
Address

April 2, 1998

Dear Name,

Thank you for agreeing to participate in our survey of winter visitors to Yellowstone National Park. There are many issues related to the management of winter use in the park. Knowing how visitors view the importance of these issues - and what kinds of actions should be considered - is vital to the National Park Service, and others who must make decisions about the management of Yellowstone National Park.

As you were entering Yellowstone this winter, you agreed to participate in this survey. You were randomly selected from all the visitors to the park on that day. For the results of the study to truly represent the thinking of all winter visitors to Yellowstone, it is important that each questionnaire be completed and returned in the envelope provided.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off the mailing list when your questionnaire is returned. This survey is voluntary, and your name will never be placed on the questionnaire itself, nor associated with your answers.

Thank you very much for your assistance. If you have any questions or concerns about this study, please write or call us collect at (406) 243-6657.

Sincerely,

Wayne Freimund
Project Co-director

Bill Borrie
Project Co-director

About Your Trip

1. What type of group were you with on the trip when you were interviewed? (check all that apply)

   [ ] alone
   [ ] family
   [ ] friends
   [ ] outfitter/guide group
   [ ] organization or club _____
   name of organization/club

2. Which of the following best describes your primary mode of transportation while you were within Yellowstone National Park? (check all that apply)

   [ ] snowmobiling
   [ ] skiing
   [ ] snowshoeing
   [ ] snowcoach touring
   [ ] automobile
   [ ] other _____
   please specify

3. If you were on a snowmobile most of the time while visiting the park, was it: (check one box)

   [ ] owned by yourself/family
   [ ] borrowed
   [ ] rented

4. Did you stay overnight in the vicinity of Yellowstone National Park? (circle one) Yes / No

   If yes, where did you stay? _____
   please specify (city)

   Was it at: (check all that apply)

   [ ] hotel/motel outside the park
   [ ] hotel/motel inside the park
   [ ] my permanent residence
   [ ] my seasonal residence
   [ ] permanent residence of family/friends
   [ ] seasonal residence of family/friends
   [ ] campsite inside the park

5. During your visit to the Yellowstone area, how many days did you recreate within Yellowstone National Park?

   _____

6. While on your trip to the Yellowstone area, did you also snowmobile or ski in other areas (such as nearby National Forest lands or National Parks)?

   [ ] no
   [ ] yes

   If yes, how many days? _____
   In which areas (National Forests or Parks) did you snowmobile or ski?

   _____

Role of Yellowstone National Park

7. We are interested in your opinions about the values of Yellowstone. Please indicate for each of the following, how important they are to the overall value of Yellowstone National Park (1 being strongly disagree, and 8 being strongly agree):

I believe Yellowstone National Park is particularly important as:	Strongly disagree • • • • • • • • Strongly agree								Don't know
a wildlife sanctuary	1	2	3	4	5	6	7	8	X
a place for education about nature	1	2	3	4	5	6	7	8	X
a place to develop my skills and abilities	1	2	3	4	5	6	7	8	X
a protector of threatened and endangered species	1	2	3	4	5	6	7	8	X
a sacred place	1	2	3	4	5	6	7	8	X
an economic resource	1	2	3	4	5	6	7	8	X
a family or individual tradition	1	2	3	4	5	6	7	8	X
a place everyone should see at least once in their lives	1	2	3	4	5	6	7	8	X
a place without most types of commercial development	1	2	3	4	5	6	7	8	X
a display of natural curiosities	1	2	3	4	5	6	7	8	X
a historical resource	1	2	3	4	5	6	7	8	X
a symbol of America's identity	1	2	3	4	5	6	7	8	X
a place for the use and enjoyment of the people	1	2	3	4	5	6	7	8	X
a social place	1	2	3	4	5	6	7	8	X
a site to renew your sense of personal well being	1	2	3	4	5	6	7	8	X
a place of scenic beauty	1	2	3	4	5	6	7	8	X
a place to be free from society and its regulations	1	2	3	4	5	6	7	8	X
a reserve of natural resources for future use	1	2	3	4	5	6	7	8	X
a tourist destination	1	2	3	4	5	6	7	8	X
a place for scientific research and monitoring	1	2	3	4	5	6	7	8	X
a place for recreational activities	1	2	3	4	5	6	7	8	X
a place for wildness	1	2	3	4	5	6	7	8	X
a place for all living things to exist	1	2	3	4	5	6	7	8	X
protection for fish and wildlife habitat	1	2	3	4	5	6	7	8	X

8. Please list the values that, to you, make Yellowstone particularly unique? (relative to other places in the winter)

i. _____

ii. _____

iii. _____

9. Given the conditions at Yellowstone National Park during your visit, how would you feel about each of the following management actions? (circle the number that shows how much you support or oppose each action)

Management action:	Strongly oppose	Oppose	Neither support nor oppose	Support	Strongly support
Provide more information for snowmobilers and skiers about things to do in the park (such as more maps and brochures)	1	2	3	4	5
Be more aggressive enforcing safety rules and regulations in the park	1	2	3	4	5
Provide more information along snowmobile and ski trails identifying points of interest	1	2	3	4	5
Provide more information concerning snow conditions and other trail conditions in the park	1	2	3	4	5
Provide more winter accommodation options in the park	1	2	3	4	5
Provide more information to snowmobilers concerning appropriate behavior (such as speeding, drinking and driving, special areas closed to snowmobiling)	1	2	3	4	5
Be more aggressive enforcing snowmobile speed limits	1	2	3	4	5
Maintain and groom snowmobile trails more often	1	2	3	4	5
Provide more information about things to see and do in areas outside of the park	1	2	3	4	5
Provide more park rangers in the park to educate and assist visitors	1	2	3	4	5
Provide guided snowmobile trips by National Park Service staff	1	2	3	4	5
Provide more trails/ locations for winter recreation use	1	2	3	4	5
Continue and increase advertisement of other winter recreation areas to disperse use	1	2	3	4	5
Plow the road from W. Yellowstone to Old Faithful to allow a wide spectrum of visitors to enjoy Yellowstone in the winter	1	2	3	4	5
Require all snowmachines to meet strict, but reasonable emissions and noise standards	1	2	3	4	5
Increase facilities provided to visitors to encourage them to use other areas of the park	1	2	3	4	5
Establish alternate use periods to help minimize conflict between user groups	1	2	3	4	5
Close roads to oversnow vehicles	1	2	3	4	5
Restrict groomed roads to snowcoach travel only	1	2	3	4	5

protect the bison herd. Considering that you may be affected by these actions, please indicate to what degree you believe visitors should be required to:

Management Action:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Watch a compulsory 30 minute educational video	1	2	3	4	5
Limit the size of groups	1	2	3	4	5
Wait up to one hour before beginning to travel	1	2	3	4	5
Travel in the park only at a particular time of the day	1	2	3	4	5
Travel in the park only in specific areas	1	2	3	4	5
Travel in the park only on particular days of the week	1	2	3	4	5
Travel in the park only in a shortened season	1	2	3	4	5
Obtain a required, randomly distributed, but limited in number, permit	1	2	3	4	5

Your Visit to Yellowstone

11. Through which entrance to Yellowstone National Park did you enter: [check one]

[ ] North/Mammoth Entrance
[ ] West Yellowstone Entrance
[ ] South/Flagg Ranch Entrance
[ ] East/Cody Entrance

12. Please list the three most rewarding places/highlights that you intended to see during your visit to Yellowstone:

1._____

2._____

3._____

13. Did you travel through Hayden Valley (Fishing Bridge to Canyon Village or vice versa) on your trip to Yellowstone?

[ ] No
[ ] Yes

14. **If the Hayden Valley had been closed** to winter oversnow travel on your trip to Yellowstone National Park, which travel option **would you have most likely chosen**.

If the Hayden Valley had been closed to oversnow travel, I would most likely have: (check one)

[ ] Taken the same route through the park to see the same destinations
[ ] Taken a different route through the park to see the same destinations
[ ] Taken a different route through the park, but see different destinations
[ ] Chosen a different entrance into the park to see the same destinations
[ ] Chosen a different entrance into the park, but see different destinations
[ ] Spent less of my time on this trip in Yellowstone
[ ] Visited surrounding National Forests/Parks instead of visiting Yellowstone
[ ] Decided not to visit Yellowstone in winter

15. People visit Yellowstone National Park for a number of reasons, and many people feel they benefit from their experiences at Yellowstone. Listed below are some potential reasons why people visit and what they might enjoy. *This question has two parts:*

First, please rate how important each reason was for ***you*** and ***your visit*** to Yellowstone. A rating of "1" means the reason was ***very unimportant*** and a "5" means the reason was ***very important***. (circle one number for *each* reason)

Second, rate the extent to which ***you*** were satisfied with each reason or experience during your visit to Yellowstone. A rating of "1" means you were ***not at all satisfied*** with the experience and a "4" means you were ***totally satisfied*** with the experience. A rating of "X" means that you don't know how satisfied you were. (again, circle one number for *each* reason)

	Importance					Satisfaction				
Reason/Experience	very unimportant	Unimportant	Neither unimportant nor important	Important	Very important	Not at all satisfied	Somewhat satisfied	Moderately satisfied	Totally satisfied	Don't know
To have adventure	1	2	3	4	5	1	2	3	4	X
To develop my skills and abilities	1	2	3	4	5	1	2	3	4	X
To do something with my family	1	2	3	4	5	1	2	3	4	X
To enjoy natural scenery	1	2	3	4	5	1	2	3	4	X
To be with members of my own group	1	2	3	4	5	1	2	3	4	X
To be with people who enjoy the same things I do	1	2	3	4	5	1	2	3	4	X
To have thrills	1	2	3	4	5	1	2	3	4	X
To have fun	1	2	3	4	5	1	2	3	4	X
To learn about the natural history of the area	1	2	3	4	5	1	2	3	4	X
To keep/get physically fit	1	2	3	4	5	1	2	3	4	X
To talk to new and varied people	1	2	3	4	5	1	2	3	4	X
To experience new and different things	1	2	3	4	5	1	2	3	4	X
To learn more about nature	1	2	3	4	5	1	2	3	4	X
To rest physically	1	2	3	4	5	1	2	3	4	X
To be challenged	1	2	3	4	5	1	2	3	4	X
To experience excitement	1	2	3	4	5	1	2	3	4	X
To learn more about the cultural history of the area	1	2	3	4	5	1	2	3	4	X
To reflect on and clarify personal values	1	2	3	4	5	1	2	3	4	X
To do something creative such as take photographs	1	2	3	4	5	1	2	3	4	X
To get away from the usual demands of life	1	2	3	4	5	1	2	3	4	X
To experience solitude	1	2	3	4	5	1	2	3	4	X
To get away from crowds	1	2	3	4	5	1	2	3	4	X
To escape the family temporarily	1	2	3	4	5	1	2	3	4	X
To share what I have learned with others	1	2	3	4	5	1	2	3	4	X
To bring my family/group closer together	1	2	3	4	5	1	2	3	4	X
To feel more self-confident	1	2	3	4	5	1	2	3	4	X
To view wildlife	1	2	3	4	5	1	2	3	4	X
To help others develop their skills	1	2	3	4	5	1	2	3	4	X
To view bison in a natural setting	1	2	3	4	5	1	2	3	4	X
To feel healthier	1	2	3	4	5	1	2	3	4	X
To experience the tranquility in the park	1	2	3	4	5	1	2	3	4	X
To be more productive at work/school	1	2	3	4	5	1	2	3	4	X
To be at a place where I can make my own decisions	1	2	3	4	5	1	2	3	4	X
To help reduce built up tension	1	2	3	4	5	1	2	3	4	X
To allow my mind to move at a slower pace	1	2	3	4	5	1	2	3	4	X
To experience peace and quiet	1	2	3	4	5	1	2	3	4	X
To be in an area where wolves continue to exist	1	2	3	4	5	1	2	3	4	X
To see Old Faithful	1	2	3	4	5	1	2	3	4	X
To snowmobile or ski in a wild and natural setting	1	2	3	4	5	1	2	3	4	X
To promote greater environmental awareness in members of my group	1	2	3	4	5	1	2	3	4	X

Traffic Conditions on Your Visit to Yellowstone

We are interested in how many snowmobiles you feel could use the roads in Yellowstone National Park without you feeling too crowded. To help judge this, we would like to know how you feel about the following conditions and scenarios.

16. How acceptable would it be to see (or "encounter") the following numbers of snowmobiles per hour as you travel through the park? Please rate the acceptability of encountering each of the following numbers of snowmobiles per hour. A rating of "-4" means that the number of snowmobiles encountered is very unacceptable, and a rating of "+4" means the number of snowmobiles encountered is very acceptable. (Circle one number on the acceptability scale for each number of snowmobiles indicated)

	Acceptability								
	Very Unacceptable								Very Acceptable
0 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
5 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
10 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
15 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
20 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
25 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
30 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
35 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
40 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
45 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4
50 snowmobiles per hour	-4	-3	-2	-1	0	+1	+2	+3	+4

17. Encounters with other snowmobiles can occur in two basic ways. First, you can meet another snowmobile that is traveling in the opposite direction (a "meeting encounter"). Second, you can pass or be passed by another snowmobile traveling in the same direction (an "overtaking encounter"). Please estimate the maximum number of each of these two types of encounters per hour that you think is acceptable as you travel through the park.

Maximum acceptable number of "meeting encounters" per hour: _____

Maximum acceptable number of "overtaking encounters" per hour: _____

18. Four pictures illustrating different numbers of snowmobiles along the road [illegible] look at these pictures and then read the following four scenarios. Each scenario indicates how many minutes out of each hour you would see the number of snowmobiles in each picture as you travel through the park. Please rate how acceptable you think each scenario would be. (Circle one number on the acceptability scale for each scenario)

Scenario 1:

You would experience picture A for 56 minutes out of each hour
You would experience picture B for 4 minutes out of each hour
You would experience picture C for 0 minutes out of each hour
You would experience picture D for 0 minutes out of each hour

Very unacceptable							Very acceptable		Don't Know
-4	-3	-2	-1	0	+1	+2	+3	+4	X

Scenario 2:

You would experience picture A for 47 minutes out of each hour
You would experience picture B for 11 minutes out of each hour
You would experience picture C for 2 minutes out of each hour
You would experience picture D for 0 minutes out of each hour

Very unacceptable							Very acceptable		Don't Know
-4	-3	-2	-1	0	+1	+2	+3	+4	X

Scenario 3:

You would experience picture A for 36 minutes out of each hour
You would experience picture B for 20 minutes out of each hour
You would experience picture C for 3 minutes out of each hour
You would experience picture D for 1 minutes out of each hour

Very unacceptable							Very acceptable		Don't Know
-4	-3	-2	-1	0	+1	+2	+3	+4	X

Scenario 4:

You would experience picture A for 18 minutes out of each hour
You would experience picture B for 33 minutes out of each hour
You would experience picture C for 6 minutes out of each hour
You would experience picture D for 3 minutes out of each hour

Very unacceptable							Very acceptable		Don't Know
-4	-3	-2	-1	0	+1	+2	+3	+4	X

19. Which of the above scenarios represents the highest level of use the National Park Service should allow on the snowmobile roads in the park? In other words, at what point should the number of snowmobiles be limited? (If the number of snowmobiles should not be limited at any point represented by the scenarios, please check one of the boxes indicated)

Scenario number: _____ OR Check one of the boxes:

[ ] The number of snowmobiles should not be limited at any point represented by the scenarios
[ ] The number of snowmobiles should not be limited at all

20. How did the number of people you saw in the park compare with what you expected to see? (check one box)

[ ] saw a lot less than expected
[ ] saw a few less than expected
[ ] saw about as many as expected
[ ] saw a few more than expected
[ ] saw a lot more than expected
[ ] I really didn't know what to expect

21. How did you feel about the number of people you saw in the park? (check one box)

[ ] would have liked to see a lot more
[ ] would have liked to see a few more
[ ] saw about the right number
[ ] would have like to see a few less
[ ] would have liked to see a lot less
[ ] I really don't know how many I would have liked to see

About You

22. Using the following scale, how would you rate yourself as a winter recreationist (using your primary activity on this trip). (circle one number)

1 2 3 4 5 6
Beginner.....Expert

23. What is your gender? (check one) [ ] Female [ ] Male

24. What is your age? _____

25. What is the highest level of education you have completed? (check one box)

[ ] 8th grade or less
[ ] some high school
[ ] high school graduate or GED
[ ] some college, business or trade school
[ ] college graduate
[ ] some graduate school
[ ] master's, doctoral or professional degree

26. In which of the following kinds of places did you spend the most time while growing up (to age 18)? (check one box)

[ ] on a farm or ranch
[ ] rural or small town [under 1,000 population]
[ ] town [1,000 - 5,000 population]
[ ] small city [5,000 - 50,000 population]
[ ] medium city [50,000 - 1 million population]
[ ] major city or metropolitan area [over 1 million population]

27. In what type of community do you now live? (check one box)

[ ] on a farm or ranch
[ ] rural or small town [under 1,000 population]
[ ] town [1,000 - 5,000 population]
[ ] small city [5,000 - 50,000 population]
[ ] medium city [50,000 - 1 million population]
[ ] major city or metropolitan area [over 1 million population]

28. What is your approximate total household income before taxes? (check one box)

[ ] under $ 10,000
[ ] $ 10,000 - $ 19,999
[ ] $ 20,000 - $ 29,999
[ ] $ 30,000 - $ 39,999
[ ] $ 40,000 - $ 49,999
[ ] $ 50,000 - $ 59,999
[ ] $ 60,000 - $ 69,999
[ ] $ 70,000 - $ 79,999
[ ] $ 80,000 - $ 89,999
[ ] $ 90,000 - $ 99,999
[ ] $100,000 - $199,999
[ ] $200,000 or more

We welcome any other comments you might have concerning the management of Yellowstone National Park. Please use the space below.

Thank you for your assistance.
Please place the completed survey in the postage-paid envelope provided. No stamp is needed.

1998 Winter Use Survey OMB # 0596-0108

16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. When analysis of the questionnaire is completed, all name and address files will be destroyed. Thus, the permanent data will be anonymous. Please do not put your name or that of any member of your group on the questionnaire. Data collected through visitor surveys may be disclosed to the Department of Justice when relevant to litigation, or to appropriate Federal, State, local or foreign agencies responsible for investigating or prosecuting as violation of law. Public reporting burden for this form is estimated to be less than
20 - 25 minutes. Direct comments regarding the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, National Park Service, P.O. Box 37127, Washington, D.C. 20014-7127; and to the Office of Management and Budget, Paperwork Reduction Project 1024-0197, Washington, D.C. 20503. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a current valid OMB control number.

Appendix B

Yellowstone National Park
1998 Winter Use Survey OMB # 0596-0108; Expiration Date 05/31/1999
The University of Montana & The University of Vermont

Date _____
Time _____
Interviewer: _____
Location: _____

1. Are you traveling by _____ snow coach, or _____ snowmobile ?

2. Please identify the road segment you were on just before this stop. Please check one.

   _____ Madison Junction to Old Faithful
   _____ West Thumb to Old Faithful
   _____ Canyon Village to Fishing Bridge
   _____ West Thumb to Fishing Bridge

3. How many snowmobiles/snow coaches are you traveling with today ? _____
4. How many people are you traveling with today ? _____
5. Are you traveling with a guided tour? Yes _____ No _____
6. What is your home zip code ? _____

7. We are interested in how many people you feel could use the Yellowstone trails at any one time without you feeling too crowded. To help judge this, we have a series of photographs that show different numbers of people on a trail like the one you were on before this stop.

Please rate each of the photographs by telling us how acceptable you feel each one is based on the number of snowmobiles shown. A rating of –4 means the number of people is *very unacceptable*, and a rating of +4 means the number of people is *very acceptable*. Please circle one number for each image.

	Very Unacceptable								Very Acceptable
Picture 1	-4	-3	-2	-1	0	1	2	3	4
Picture 2	-4	-3	-2	-1	0	1	2	3	4
Picture 3	-4	-3	-2	-1	0	1	2	3	4
Picture 4	-4	-3	-2	-1	0	1	2	3	4

8. We are also interested in ***how often*** you encountered varied numbers of snowmobiles on the section of trail you identified in question 2. Please look at the pictures again and identify the percentage of time you saw the approximate number of snowmobiles in each picture.

Picture 1 _____% Picture 2 _____% Picture 3 _____% Picture 4 _____%

9. We are also interested in ***how appropriate*** you feel it is for varied numbers of snowmobiles to use the section of trail you identified in question 2 during the time period you were just on the trail. Please look at the pictures again and identify the percentage of time you feel is appropriate for the number of snowmobiles in each picture to be on the trail during an approximate 1/2 hour time period.

Picture 1 _____% Picture 2 _____% Picture 3 _____% Picture 4 _____%

Over, please .....

Finally, we would like to as you a few questions about your trip so far today.

10. Please rate the acceptability of the following items
(Again, from -4, very unacceptable to 4, very acceptable).

	Very Unacceptable								Very Acceptable
The smoothness of snow on groomed roads	-4	-3	-2	-1	0	1	2	3	4
Snow machine fumes from vehicles not within your group	-4	-3	-2	-1	0	1	2	3	4
The unsafe traveling behavior of people not within your group	-4	-3	-2	-1	0	1	2	3	4
The number of encounters with other vehicles that were not with your group	-4	-3	-2	-1	0	1	2	3	4

11. How did the number of people you saw in the park compare with what you expected to see?

____ saw a lot less than expected
____ saw a few less than expected
____ saw about as many as expected
____ saw a few more than expected
____ saw a lot more than expected
____ I really didn't know what to expect

Please use the following space to offer any comments you have for the management of Yellowstone National Park.

Appendix C

A
B
C
D